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# Chemical Abstracts

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# CHEMICAL ABSTRACTS

Vol. 13.

JANUARY 10, 1919.

No. 1

## 1. APPARATUS.

L. C. JONES.

A device for introducing a vapor into a gas. E. H. ZEITFUCHS. *J. Am. Chem. Soc.* 40, 1899(1918); illus. E. J. C.

A simple method of rapidly and accurately calibrating pipets. S. ENGLISH. *J. Soc. Glass Tech.* 2, 216-9(1918).—Original graduations are seldom correct. The error due to (1) inaccuracy of first calibration or (2) change due to afterworking of the glass may be as great as 0.2 cc. Afterworking may be minimized by annealing and allowing the pipet to stand for a month or so before calibration. Calibration by weighing, if carefully done, takes at least 15 min. An improved rapid method consists in (1) inverting the pipet over one stopper of a 2-necked Woulfe bottle, the other neck of which is connected to a H<sub>2</sub>O reservoir at higher level, (2) filling the pipet, (3) running the H<sub>2</sub>O back into the bottle, which at the same time forces an equal amt. of displaced H<sub>2</sub>O to flow into an auxiliary bulb with calibrated neck, this bulb having been previously calibrated against a standard pipet. Details are given. The method is rapid, 30 pipets per hr. being handled. C. H. KERR.

Apparatus for measuring chimney heat loss (CHOPIN) 21. Theory of the thermionic amplifier (VAN DER BIJL) 3.

Sulfur burners. PRATT ENGINEERING & MACHINE CO. Brit. 118,097, July 13, 1918. A method of burning S consists in maintaining in a chamber a pool of molten S, and in considerably increasing the surface area exposed to the combustion air, e. g., by spraying the S in fountain-like jets by means of air blasts delivered into the pool. The air supply in the vicinity of the pool is restricted to the amt. for volatilizing the S at the desired rate, and the oxidation is completed in a series of combustion chambers. A suitable app. is specified.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

The trained man of science in the war. J. S. AMES. *Science* 48, 401-10(1918). E. H.

The ionic theory of solid substances. A. L. BERNOULLI. Univ. Basel. *Helvetica Chimica Acta* 1, 289-96(1918); cf. *C. A.* 12, 2468.—Nernst and Lindemann have computed the mol. heat capacity of rock salt and sylvine from the data of Rubens and Hollnagel on the wave length of the residual rays. This is in good agreement with the thermal data. Koref gives a method of calcg. the frequency of each atom in a binary compd. from the m. p., and mol. vol. of the compd. and the at. wt., at. vol. and density of the elements. This is supported by the exptl. work of Russel, which showed the change in the frequency on entering into chem. combination. Hence the absorption bands in a chem. compd. are not exactly identical with those of the components. In

the previous article the formula of Einstein for the calcn. of the wave length from vol. elasticity in the case of monatomic metals was subject to a correction. This theory is now extended to polyatomic compds. From X-ray analysis it is known that rock salt is composed of a cubic lattice with Cl and Na atoms at alternate corners. Thus the salt consists of ions and is completely dissociated. On this assumption the wave length is found as before. For binary compds.  $\lambda = 657.6 \rho^{1/6} \cdot \sqrt{x} \cdot M^{1/2}$ , where  $\rho$  is the d.,  $x$  the coeff. of cubical compressibility, and  $M$  the mol. wt. of the ion constituent. The derivation is admittedly not rigid. Observed and computed values for  $\lambda$  are given, in the case of NaCl, KCl, KBr, KI, CaCO<sub>3</sub>, CaF<sub>2</sub>, and SiO<sub>2</sub>. For NaCl the agreement is considered good. In KCl, the frequencies of the K<sup>+</sup> and Cl<sup>-</sup> are so close together as to be hardly distinguishable by this method. For CaCO<sub>3</sub> and SiO<sub>2</sub> the simplifying assumptions do not hold, but the agreement is fair. For Na<sup>+</sup> in NaCl  $\lambda$  observed = 53.6 and  $\lambda$  calcd. 54.9; for Cl<sup>-</sup> observed  $\lambda$  = 53.6 and calcd. 50.3. Examples are given of the computation of elasticity data from wave length. From the kinetic theory the wave lengths of the 2 constituents of a compd. should be related to the at. wts. of the ions by the equation  $\lambda_2 = \lambda_1 \sqrt{M_2/M_1}$ . B. shows this to be the case for NaCl, KBr, and CaF<sub>2</sub>. F. C. HOYT.

The heat of dissociation of diatomic gases in connection with the increased values of  $\sqrt{a}$  for free atoms. J. J. VAN LAAR. *Chem. Weekblad* 15, 1124-37(1918).—No noteworthy exceptions have been observed to the rule that the values for  $b$  and  $\sqrt{a}$ , in the van der Waals equation of state, are additive. The quantity  $b$  is quite independent of whether the atom is free or combined; but  $\sqrt{a}$  depends largely on this factor. The central atom in such compds. as CH<sub>4</sub>, NH<sub>3</sub>, SiCl<sub>4</sub>, etc., exerts no attraction outside the mol.; hence in these cases  $\sqrt{a} = 0$ . A double bond gives partial freedom, so that in C<sub>2</sub>H<sub>4</sub>  $\sqrt{a}$  becomes 1.55; and a triple bond gives full freedom, so that in C<sub>2</sub>H<sub>2</sub>  $\sqrt{a}$  has the full value of the C atom, 3.1. This rule of the additivity of  $\sqrt{a}$  explains observed facts much better than the valence rule of Mathews, to which many serious exceptions occur. For atoms in the free state, the values are greatly increased (30 to 40 instead of 1 to 11). This increase represents the actual valence attraction, while the lower values in compds. represent residual attraction. Certain elements at their crit. temps. show partially increased values of  $\sqrt{a}$ , indicating dissociation. The following examples are cited: As<sub>4</sub>, 20% dissociated; Se, 30%; Te, 80%; Br<sub>2</sub>, 5%; I<sub>2</sub>, 10%; P<sub>4</sub>, not dissociated. Atomic C gives a value of 32, which is 10 times the value for the C atom in compds. Te has the peculiarity of exerting its entire residual attraction even in the compd. TeCl<sub>4</sub>, the value of  $\sqrt{a}$  being 9 instead of 0. This is ascribed to the high at. vol. of Te. A similar effect is noted in SbCl<sub>3</sub>, and to a less extent in PCl<sub>3</sub>, POCl<sub>3</sub>, AsH<sub>3</sub>, AsCl<sub>3</sub>, and SbH<sub>3</sub>. That the central atoms in such compds. as CCl<sub>4</sub> and SnCl<sub>4</sub> exert no outside attraction has the effect of making the crit. temp. much lower than it would otherwise be. Thus, calcg. the crit. temp. of CCl<sub>4</sub> on the assumption that  $\sqrt{a}$  is increased by 3.1 (the normal residual attraction of the C atom) gives 453° instead of the actual value 283°. On the other hand, elements occurring in the atomic state, in which  $\sqrt{a}$  is increased by the valence attraction, have extremely high crit. temps. The metals are the most important examples. If free C were associated to C<sub>2</sub> its crit. temp. would be about -150°. The author shows, from mathematical considerations based on the van der Waals equation of state, that the heat of dissociation of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, etc., is completely accounted for by the increase in energy due to the valence attraction of the liberated atoms. Upon the same basis he presents calcns., from the known heats of dissociation of H<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, Cl<sub>2</sub>, Br<sub>2</sub> and I<sub>2</sub>, of the values of  $\sqrt{a}$ . These support the contention stated above. The paper closes with a criticism, in the nature of a general polemic, against those who foster the fallacy of connecting the Nernst heat theorem with the equation of Gibbs (1878), Planck (1887) and others for the dissociation of gases.

JULIAN F. SMITH.

**Relation between vapor pressure and temperature.** M. KATAYAMA. *J. Tokyo Chem. Soc.* 39, 547-84(1918).—In the well-known vapor-pressure formulas, the pressure is represented as a function of temp. K., expressing the sp. heat of liquid and gaseous phases as a function of temp., has transformed the formulas of Clausius and Clapeyron into:  $A - (B/T) = \log p + C_p^n - D_p^{2n}$ , in which  $n = 1/2$  and  $C = 0.05875 + 20.05D$ . Therefore  $A - (B/T) = \log p + 0.05875 p^{1/2} + D(20.05 p^{1/2} - p^{1/2})$ , which gives a result in satisfactory agreement with observations by other investigators. The constants  $C$  and  $D$  have some relation to the association of liquid. S. KOMATSU.

**Determination of the normal density of ethylene.** T. BATURCAS. *Helvetica Chimica Acta* 1, 136-41(1918); *J. chim. phys.* 16, 322-49(1918).—Data for the exact d. of ethylene are old and unreliable or inadequate. The investigations of Bretschger and Stahrfass are inadequate in that the gas was obtained from but one source. B. prepared the gas by the four following methods: (1) dehydration by phosphoric acid, (2) dehydration by boric anhydride, (3) dehydration by  $H_2SO_4$ , (4) catalytic dehydration by Al. The gas was purified by washing with KOH, refractionating, and by scrubbing with the liquefied gas. The results showed that the purification was very satisfactory. The density was detd. by the balloon method used in Geneva. Although Hg is not attacked by ethylene a paraffin oil manometer was selected, since it is 15.5 times as sensitive as a Hg manometer. Thus the slightest variations in pressure were easily noted. The balloons used had a vol. of 0.6 to 0.8 liter. The mean density values obtained represent the result of about seven detns. per balloon. (1) 1.26021, (2) 1.26024, (3) 1.26042. The density of ethylene is then 1.2603 under normal conditions. T. SHEDLOVSKY.

**A consideration of causes for abnormal boiling points.** A. BERTHOUD. *J. chim. phys.* 16, 245-78(1918).—Polemical. Contrary to Forcrand's (cf. *C. A.* 12, 886) opinion, mol. dissociation tends to raise the b. p. of a pure liquid appreciably. The hypotheses of Forcrand, according to which the abnormal b. ps. of water, HF and  $NH_3$  would be related to the heats of formation and to the dissymmetry of the mols., do not conform to the facts. The calcs. based on the addition of the const.  $\sqrt{a}$  and  $b$  of van der Waals presented by van Laar show that, of the substances studied, AcOH is the only one whose relatively high b. p. and critical temp. may be explained by association alone. In the case of water, alcs., and ammonia another factor enters. These substances have abnormal critical pressures, not accounted for by mol. association. The cause which produces these great critical pressures and also helps raise the b. p. and critical temp. of water and alcs. is found in the particularly high value reached by the const.  $a$ , independently of mol. association, in those substances which contain the OH group. In the case of  $NH_3$  there is a greater diminution in the const.  $b$  than in the const.  $a$ . T. SHEDLOVSKY.

**Cineole as a solvent in cryoscopy.** C. E. FAWSITT AND C. H. FISCHER. *J. Roy. Soc. N. S. Wales* 51, 467-72(1917).—The f. p. of cineole has been found to be  $0.9^\circ$  instead of  $-1^\circ$  as usually given. With benzophenone, nitrobenzene, bromobenzene, toluene, benzene, and chloroform as solutes the cryoscopic const. has been found to be 6.7.  $Et_2O$ , EtOH and butyl alc. give lower values. The latent heat of fusion for cineole is calcd. to be 22.2. D. MACRAE.

**Silicic acid gels.** HARRY N. HOLMES. Oberlin College. *J. Phys. Chem.* 22, 510-19(1918).—H. gives a method for making  $SiO_2$  gels which will set in a given time. He also studies the effect of high H-ion concn. and of temp. on the time of set.  $CO_2$ -free water-glass is poured into an equal vol. of acid and stirred quickly. The electrolyte is not removed. The mixt. is considered set when a tube of it can be inverted

and tapped without causing the gel to flow out. The set occurs most rapidly for slightly basic mixts. A plot is given showing the time of set for several different concns. of a few acids. As the H-ion concn. increases, the time of set is delayed, but at great concns. the time of set again becomes measurable; 24 *N* H<sub>2</sub>SO<sub>4</sub> gives an immediate set. Fleming stated that the time of set depends only on the catalytic effect of H- or OH-ion concn. of silicic acid, and the temp. Since Fleming did not work at high concns., he did not notice that here the time of set decreases again. While at low concn. the H-ion exerts the greater influence on the time of set, above a certain concn. the dehydrating effect predominates. Increased temp. hastens the time of set, the accelerating effect being between the temps of 20° and 60°. At higher temps. the dehydrating effect of non-ionized mols. probably decreases; therefore, the time of set will be about the same with any acid, if these are of the same strength. The dehydrating influence of non-ionized mols. must be considered as a factor in detg. the time of set of gels.

A. W. CONTIERI.

**Investigations on the imbibition of water by gelatin.** E. B. SHREVE. *Science* 48, 324-7 (1918).—The imbibition of water by gelatin gels depends not only on the concn. of the gel used, but also on its previous history with respect to the concn. to which the original gelatin soln. was made up. Of two gels of the same concn. of which one was made by evapn. of a dil. soln. of gelatin and the other from a more concd. soln., the first shows greater imbibitory power than the second. Freshly cut cubes of gel immersed in water show equal ratios of increase along all 3 dimensions, but if they have previously undergone evapn. the increase is greatest on those dimensions perpendicular to the surfaces from which most evapn. has occurred, *i. e.*, the distribution of amt. of increase along the 3 dimensions is in the same ratio as the diminution by shrinking has been. The evapn. of water from the surface of gelatin changes in some way the physical structure of the gelatin; therefore, for reproducible results it is necessary to see that the original compn. of the gelatin soln. is always the same, that the previous history of all the gel used is the same and if water loss is to take place before absorption then pieces of identical shape must be used, and all measurements must be made on similar axes.

H. I. MATTELL.

**The osmotic action of cane sugar, silver nitrate, and lithium chloride in pyridine when separated from pyridine by a rubber membrane.** ALFRED E. KOENIG. *J. Phys. Chem.* 22, 461-79 (1918); cf. *C. A.* 2, 3181.—The first part of the paper gives a detailed description of the app. used, together with an account of the methods employed to obtain pure reagents. The osmotic pressure of sugar in pyridine is in good agreement with the value demanded by the gas laws, the 0.1 *M* soln. showing the closest agreement. The osmotic pressure of AgNO<sub>3</sub> is much lower than the theoretical value. LiCl also shows values which are too low even on the assumption that the salt is undissociated. By using different membranes, different values for the osmotic pressure are obtained. This fact K. considers as being in accord with the selective or chem. theory of osmosis, maintained by Kahlenberg. The pressures, after reaching a max., decreased. This seems to be due to an alteration in the nature of the rubber membrane due to its contact with pyridine, as a used membrane shows lower values than a fresh one. The pressure obtained, therefore, depends on the nature of the membrane employed.

A. W. CONTIERI.

**The thermo-electricity of tungsten.** H. PÉCHEUX. *Compt. rend.* 167, 487-9 (1918).—Here are recorded the results of a study of the resistivity and thermo-elec. power of three W filaments containing various amts. of Fe. The increase of resistivity with temp. is considerably less with those richer in Fe. W lies between Cu and Pt in the thermo-elec. series, and Cu is between Ta and W.

G. L. CLARK.

The coefficients of magnetization of oxygen and nitric oxide, and the theory of the magneton. E. BAUER, P. WEISS AND A. PICCARD. *Compt. rend.* 167, 484(1918).—Three methods for measuring coeffs. of magnetization are described. In two of these the magnetic value of water is measured first in an atm. of  $H_2$ , and then in the gas studied, the susceptibility being thereby obtained by the formula  $x = x_0 \cdot (h - h_0)/h_0$ , where  $x_0$  is the susceptibility of water. Certain systematic errors are found and corrected. For example, the soln. of a magnetic gas in water lowers the diamagnetic susceptibility 4 to 6 per 1000. But if water changes its properties from one expt. to the next and if it dissolves only some  $H_2$  without influence upon its susceptibility in detg. the value of  $h_0$ , while it absorbs some paramagnetic gas in detg.  $h$ , the error may be as great as 3.3 per 100 for  $O_2$  and 5 per 100 for NO. The third method is new and independent of these variations: A horizontal column of paramagnetic gas is in access to the atm. at one end and the other is in a magnetic field. By means of a small  $H_2O$  manometer the excess pressure in the field over the exterior pressure is directly measured. The following values are obtained ( $x$  = coeff. of magnetization and  $\sigma$  = magnetic moment per g.-atom or mol.):

$$(O_2) \quad x_{20} = 1.077 \times 10^{-4} \pm 0.003 \times 10^{-4}; \sigma = 1.587 \times 10^4.$$

$$(NO) \quad x_{20} = 0.487 \times 10^{-4} \pm 0.0025 \times 10^{-4}; \sigma = 1.033 \times 10^4.$$

Dividing by the g.-magneton deduced by Langevin from kinetic considerations, 1123.5, there is obtained for the atom of O  $n = 7.06$  and for NO  $n = 9.20$ , two values which are not whole numbers and whose deviations therefrom cannot be attributable to exptl. error. These facts contradict the theory of the magneton; either O and its compds. are exceptions to the general law or the observed discordances indicate disagreement between the classic kinetic theory and the facts. G. L. CLARK.

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The equilibrium between carbon monoxide, carbon dioxide, sulfur dioxide and free sulfur (FERGUSON) 6.

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

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GERALD L. WENDT.

The radioactive properties of the mineral springs of Colorado. O. C. LESTER. Univ. Colo. *Am. J. Sci.* 46, 621-37(1918).—This investigation covers some 200 springs in Colo. They show a high average activity. Though some are inactive, some (as high as  $305 \times 10^{-10}$  curie Ra Em per l.) are the most active yet found in the U. S. and are surpassed by but few foreign springs. The greatest activity of spring gases (1280, in the same units) is exceeded in the world only by a few springs in the Yellowstone National Park. Location of the springs is not given. No connection was found between the activity of the water and its chem. properties or its temp., nor between the activity of water or gas and that of solid deposits. Of the active springs 61% are in pre-Cambrian formations, 14.7% in igneous rock and 24.2% in sedimentaries of various formations. There is no connection between active springs and the location of deposits of Ra ores. The most active springs are found on both slopes of the Continental Divide and not far from it, and no bodies of radioactive ores are near them. The activity of the waters is probably slowly accumulated by long flow over weakly active material. If there had been contact with Ra ore deposits the activity of the water would have been of quite different magnitude. The "boiling-out" method was used for the detn. of the Ra Em in the waters. G. L. WENDT.

Polarization measurements at wire cathodes in separately ionized gases. C. A. SKINNER. *Phys. Rev.* 12, 136-42(1918); cf. C. A. 11, 909. 1783.—A report on the

wire cathode in separately ionized O and H. If  $V_b$  is the polarization p. d. and  $j$  the current density at the cathode for both plates and wires the ratio  $V_b/j^2$  is constant over a considerable range of polarization potentials. The lower limit of this range is detd. by the temp. of the positive ions and their reflection constant, and has practically the same value for both H and O, viz., 10–11 v. The upper limit for H is about 80 v. and for O about 140 v. If it is true that under this bombardment potential the liberation of electrons from the cathode becomes sufficient appreciably to increase the ionization in the surrounding gas, it must be concluded that H ions produce at 80 v. velocity what O ions require about 140 v. to accomplish. The upper limit is about the same for both plates and wires, while the lower limit for wires is slightly lower than that for plates.

A. L. FEILD.

**Simplified theory of the cathode fall in gases with application to plates and wires.** C. A. SKINNER. *Phys. Rev.* 12, 143–57(1918).—It is shown that an extremely small electron current, conceived to be liberated from the cathode under the bombardment of the positive ions, may account for the ionization between the cathode and the negative glow. Since  $1/2$  the current in the negative glow is carried by positive ions, and the rate of production of ions at any pt. is proportional to the total rate of ionization between that pt. and the cathode, it follows that: at one ionizing interval from the negative glow toward the cathode, the positive ions carry  $3/4$  of the current; at two ionizing intervals  $7/8$ , and so on. It is conjectured that the actual conditions may be effectually represented by assuming a localized source of ions either in the negative glow or somewhat nearer the cathode. With this as a basis the resulting potentials between the effectual source and the polarization region at the cathode are calcd. for both plane and cylindrical cathodes. The theory is exptly. tested with Al cathodes in H. With a plate cathode the effectual source lies somewhat nearer the cathode than the point of minimum gradient in the negative glow. Otherwise the theoretical curves fit the observations for different currents, and the various currents agree in furnishing the same value for the mobility of the positive ions. With wire cathodes the agreement between the theory and observations is practically perfect. The closeness with which the simple theory of localized ionization fits the results is strong evidence of an excessive degree of ionization in the negative glow as compared with that in the space toward the cathode. The results seem to indicate a condition similar to that exhibited by  $\alpha$ -rays, namely, increasing ionization with decreasing velocity. Assuming that the polarization region at the cathode is marked in extent by the cathode glow, the polarization p. d. is found to be proportional to the potential gradient per mean free path of the positive ions at their entrance to this region.

A. L. FEILD.

**The phenomena of fluorescence.** DESMOND GREGGHEGAN. *Chem. News* 117, 322 (1918).—A brief statement of commonly known facts, the conclusion being: "The phenomena of fluorescence arise from a diminution in the refrangibility of the ultraviolet rays which are ordinarily too refrangible to render them visible to the eye."

G. L. WENDT.

**The spectrum of cadmium in the inactive gases.** J. N. COLLIE AND H. E. WATSON. *Proc. Roy. Soc. London* 95A, 115–20(1918).—A preliminary report on the appearance of the spectra of electrode metals in discharges through the inactive gases. Cd was used because of its bright and broad spectrum but Zn, Mg, Pb and Bi act similarly. The brightest Cd lines appear in the spectrum of the gas in the cathode region even at relatively high gas pressures. Ne at 60 mm. pressure and He at 40 mm. showed some of the lines. The lines differ in brightness. Some are nearly always absent; some vary sharply with the pressure. It is difficult to obtain the lines at all in Kr while in Xe the electrodes melt. There was no obvious connection in the behavior of a line at different pressures or in different gases or of different lines in the same gas.

At one time there formed at the cathode a green ball of Cd vapor with a red tail 7 cm. long. This rotated slowly round the cathode with the tail pointing down the tube, and soon broke up. The Cd and A gases seemed to be separated. No explanation of the various phenomena is offered. The metallic spectrum appears with the feeblest currents when the tube and electrodes are quite cold. These phenomena are absent when diatomic gases are used.

G. L. WENDT.

**Measurements in the spectrum of molybdenum according to international normals.**

MARTHA PUHLMAN. *Z. wiss. Photochem.* 17, 97-131(1917); *J. Chem. Soc.* 114, II, 142.—Measurements were made with a large concave grating. Results in the region  $\lambda 2420$  to  $\lambda 4888$  are compared with those of Exner and Haschek. No evidence was found for constant frequency differences in certain pairs of lines, as suggested by Paulson.

G. L. WENDT.

**The arc spectrum of tungsten according to international units.** MARIA BELKE.

*Z. wiss. Photochem.* 17, 132-42, 145-68(1917); *J. Chem. Soc.* 114, II, 142.—The region  $\lambda 2249$  to  $\lambda 6984$  was measured and treated as in the preceding abstract, with the same conclusions.

G. L. WENDT.

**Arc spectrum of europium and of a new element between europium and samarium.**

J. M. EDER. *Sitzb. Akad. Wiss., Wien.* 126, 473-531(1917); *Science Abstracts* 21A, 264-5; cf. *C. A.* 11, 1081, 2637.—A table of the wave lengths and intensities of about 1200 lines from  $\lambda 7370$  to  $\lambda 2373$  is given. No evidence that Eu is anything but a simple element was obtained. In a Eu fraction containing Sa a no. of unknown lines were observed which seem to belong to an element lying between Eu and Sa, and for which the name euro-samarium is proposed. The lines, more than 200 in number, extend from  $\lambda 6300$  to  $\lambda 3260$ , being for the most part of low intensity. It is possible that they may belong to one of the rare earths whose spectrum has not been thoroughly investigated. The evidence, however, does not point to this conclusion. A Eu prepn. free from Sa did not give the new lines.

A. L. FEILD.

**Crystal structure of the alums and the role of the water of crystallization.** L.

VEGARD AND H. SCHJELDERUP. *Ann. Physik* 54, 146-64(1918); *Science Abstracts* 21A, 266.—By means of Bragg's  $\alpha$ -ray reflection method, measurements were made on the 4 following alums: ammonium alum, potassium alum, iron-ammonium alum, and chrome alum. A table is given of reflection angles and relative intensities, with the Rh line as a source of monochromatic X-radiation. The position of the  $H_2O$  groups and the complete structure of the crystal are shown by means of models. A very complex structure obtains in all cases.

A. L. FEILD.

**Theory of the thermionic amplifier.** H. J. VAN DER BIJL. *Phys. Rev.* 12, 171-98

(1918).—Theoretical treatment of the operation of the thermionic amplifier, together with a discussion of certain features of design. A voltage amplification of several hundred fold is not difficult to obtain, while a power amplification of several hundred fold was found possible when a plate voltage of only about 100 v. was used.

A. L. FEILD.

Radiation pattern of the transformation of magnesium hydroxide to magnesium oxide, etc. (V. D. LINGEN) 8. Coefficients of magnetization of oxygen and nitric oxide, and the theory of the magneton (BAUER, *et al*) 2.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

Surplus electric power after the war. J. W. BECKMAN. *Trans. Am. Electrochem. Soc.* 34 (advance copy); *Elec. Rev. West Elec.* 73, 735-6(1918); *Chem. Met. Eng.*

19, 613(1918).—A very important electrometallurgical development awaiting a successful solution is the direct manuf. of steel from iron ore. The other industry which would serve to help to consume elec. power after the war is the fertilizer industry. This includes the N-fixation industry and the elec. extn. of sol. phosphates from phosphate rock. The elec. method makes the phosphates completely sol. whereas by the old  $H_2SO_4$  method only a small % of P is rendered sol. C. G. F.

**The electric furnace after the war.** FRANCIS A. J. FITZGERALD. *Trans. Am. Electrochem. Soc.* 34 (advance copy); *Elec. Rev. West. Elec.* 73, 726-7(1918).—The induction type furnace did not develop as was expected, during the war, but the outlook for the future is very bright. The advantage of dispensing with the electrodes cannot be overlooked. Owing largely to the shortage of graphite crucibles and the consequent high expense involved, the development of the elec. furnace for brass has been greatly stimulated during the war and now there can be no question that elec. brass furnaces will be largely employed. The use of the elec. furnace greatly increased during the war and is bound to be still further extended after the war. Government ownership of hydroelectric systems is the most serious menace to the future of the elec. furnace so far as the larger developments are concerned. C. G. F.

**Performance and equipment of two-ton electric furnace.** ANON. *Elec. Rev. West. Elec.* 73, 747-8(1918); *Elec. Engineering* 52, No. 5, 12-3(1918).—The furnace, of the Heroult type, has a capacity of 2 tons. It is used for melting nichrome and high-nickel steel. The temp. of the furnace averages about  $2200^\circ$ . The primary side of the transformers is at 2200 volt, 60 cycle, 2 phase. There are 2 400-kva transformers. They are Scott connected so that they change the high-voltage 2-phase current into low-voltage 3-phase current, so as to have 1 phase for each of the 3 electrodes of the furnace. The power factor is from 85 to 90%. Full details are given and 6 cuts are shown. Cf. Easton, C. A. 12, 2068. C. G. F.

**Electric smelting of manganese ores.** ANON. *Elec. Engineering* 52, No. 5, 26(1918).—In 1917 115,000 tons of Mn ore containing more than 40% of metallic Mn were electrically smelted in U. S. compared with 27,000 in 1916 and 4,000 tons in 1913. C. G. F.

**Performance data on a brass-melting furnace.** A. S. WITMER. *Elec. World* 72, 891(1918).—Record of an 8-day run of a Baily furnace for brass melting. Energy per 100 lb. of brass poured, 12.7 kw. hr. Metal loss per 100 lb. of brass poured, 1.13 lb. The usual metal loss with oil-fired brass furnaces is 7 lb. With oil at 6 c. per gal., elec. energy at 1.5 c. per kw. hr. and metal at 20 c. per lb., the saving amounts to \$1.22 per 100 lbs. of metal poured. C. G. F.

**Federal nitrate plant (Cincinnati) power contract features.** ANON. *Elec. World* 72, 894(1918). C. G. F.

**The Zorzi system for the electrolytic production of hydrogen and oxygen.** G. CARRARA. *Elettrotecnica* 5, 86-90(1918); *Science Abstracts* 21B, 185.—The Zorzi cell is characterized by absence of diaphragms and by the peculiar shape of the electrodes. Each battery is formed of 16 Fe bells, open at the top, soldered to Fe bars and equally spaced. Each Fe bell is covered by a glass bell, also open at the top. A larger glass bell covers the column so as to lead the gas into a collector pipe. The gases developed at the surfaces of the Fe bells are immediately sent through the collector pipe to reduce to a minimum diffusion of one gas into the other. H and O collector pipes connect with trunk pipes which lead to gasometers. The electrolyte is a soda soln. (sp. gr. 1.17). The gases have a high degree of purity: 1.92% H in the O; 0.34% O in the H. The Zorzi cells are in successful operation at Varese.

W. H. BOYNTON.



**Storing direct-current aluminium arresters for the winter.** F. T. FORSTER. *Gen. Elec. Rev.* 21, 820-1 (1918).—When d. c. Al arresters are taken out of service the electrolyte should be poured into clean bottles and the Al plates washed in gasoline and then rinsed in clean warm water, after which they should be put back into the empty jar until again needed for service. This method is decidedly better than allowing the electrolyte to remain in the jars and applying a low voltage throughout the winter. Tests have shown that the Al film has the property of acquiring a critical voltage value corresponding to any voltage that is applied to it for a considerable length of time, provided this voltage is below the max. critical value. Detailed tests are tabulated and discussed. C. G. F.

**Experimental examination of the arc in gases under pressure.** W. MATHIESEN. *Electrician* 81, 451-3 (1918); see *C. A.* 12, 2069. C. G. F.

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Synthetic nitrogen products (MORSELLI) 18. "Gasteam" plant (ANON.) 21.

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**Storage battery.** B. FORD. U. S. 1,280,982, Oct. 8. Structural features.

**Electrolytic production of permanganates.** M. SCHOELD. U. S. 1,281,085, Oct. 8.  $\text{Na}_2\text{MnO}_4$  is converted into  $\text{NaMnO}_4$  by electrolysis and  $\text{KMnO}_4$  is then produced by reacting on the  $\text{NaMnO}_4$  with  $\text{K}_2\text{CO}_3$ . An electrolytic cell for use in the production of the permanganate is described.

**Electrolytic production of alkalis.** N. STATHAM. Brit. 118,355, Sept. 26, 1917. A diaphragm between an anode chamber and an empty cathode chamber allows passage of sufficient electrolyte to prevent back diffusion of  $\text{NaOH}$ . It may be faced on the discharge side with less porous material arranged so as to render the lower parts of the diaphragm less permeable than the upper parts. Uniform percolation throughout the diaphragm can thus be obtained. The body of the diaphragm may be of asbestos board or paper, and the facing of finer asbestos, incorporated with or applied to the body, and either stepped or steadily increasing in thickness downwards. Percolation takes place preferably at such a rate that, with concd. brine in the anode compartment, the cathode liquid may contain about equal proportions by wt. of alkali and salt, say 11 parts of the former to 10-11 parts of the latter. A direct overflow from the anode compartment of about 100 cc. of brine per sq. ft. of diaphragm surface may be provided for. The perforated cathodes may be sustained by perforated ribs on coverplates. Cf. 5,197, 1893, 20,889, 1903, and 27,830, 1907.

**Electrically fusing and depositing metals.** E. H. JONES. Brit. 116,308, Apr. 12, 1917. An arc electrode contains all the constituents requisite for the deposition of *high-speed steel*, and is covered with slag-forming material. *E. g.*, the electrode may consist of a mild-steel trough filled with a mixt. of 1.3 parts of C, 22 of W, 9 of Cr, and 0.25 of V, the Fe of the trough amtg. to 67.45 parts. In some cases, the steel only requires 6% of W. Mo may partly replace W, and other materials such as Ni and Co may be added. The whole is wound with asbestos yarn. Cutting parts of tools may be made or renewed by deposition from such an electrode; or the steel may be received by a mold at the bottom of which is the second electrode. Cf. 3,762, 1911 (*C. A.* 6, 2036), and 109,652 (*C. A.* 12, 123).

**Reducing iron ores.** H. A. GREAVES and H. ETCHILLS. Brit. 118,647, June 12, 1917. Gases given off in smelting Fe ores in an elec. furnace are passed through a rotary tube furnace through which the ores are passed on their way to the elec. smelting furnace. Details of construction and operation are specified.

**Alumina.** NORTON Co. Brit. 118,605, July 11, 1918.  $\text{Al}_2\text{O}_3$  is prepd. in fused condition from crude materials such as bauxite and clay by fusing the material with

an excess of C in an elec. furnace, sepg. the reduction products of the impurities, and then adding a solid oxidizing compd. to oxidize the partial reduction products of the  $\text{Al}_2\text{O}_3$ . As oxidizing agents,  $\text{Fe}_2\text{O}_3$ ,  $\text{SiO}_2$ , or  $\text{TiO}_2$  may be used, or crude bauxite or volatile materials such as  $\text{ZnO}$  or  $\text{Na}_2\text{CO}_3$ . An excess of the oxidizing substance may be employed, with or without some C, to reduce a part of the excess.

**Alumina.** NORTON CO. Brit. 118,606, July 11, 1918. In the fusion of  $\text{Al}_2\text{O}_3$  in an elec. furnace having a C hearth, the partial reduction of the lower layer of the charge is prevented by mixing with the lower layer small proportions, such as 5%, of a reducible material contg. O, such as  $\text{Fe}_2\text{O}_3$ , or, preferably, a material the products of reduction of which will be volatilized during the treatment, *e. g.*,  $\text{ZnO}$  or soda ash. When a volatile substance is added, the quantity may be considerably in excess of the amt. necessary to prevent reduction, so as to protect the  $\text{Al}_2\text{O}_3$  completely.

**Purifying drawn tungsten wire.** A. PACZ. U. S. 1,280,825, Oct. 8. Drawn W wire which has become associated with impurities such as C during its manuf. is heated to redness with air for a short time and afterward heated for some time at a white heat, in an atm. of N 88 and H 12%, to reduce oxides formed during the heating in air. The method is especially adapted for treating W previously treated to render it "non-off-setting."

**Tungsten filaments.** C. T. FULLER. U. S. 1,280,704, Oct. 8. W filaments which have been formed by ordinary mechanical drawing are heated at least to redness in an oxidizing atm., after which they may be heated to a higher temp. *in vacuo* or in an inert gas to increase their ductility and pliability and improve their capacity for retaining these properties during use in incandescent lamps. The process is especially adapted for the treatment of "non-off-setting" filaments.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

**Observations on the rare earths. VIII. Separation of yttrium from erbium; the ratio  $\text{Er}_2\text{O}_3 : 2\text{ErCl}_3$ .** E. WICHERS, B. S. HOPKINS AND C. W. BALKE. *J. Am. Chem. Soc.* 40, 1615-9(1918); cf. *C. A.* 11, 237; 12, 1156, 1157, 2072.—A comparative study was made of newer methods for sepg. Y and Er using material of at. wt. 108.5 free from other rare earths. Both the cobalticyanide and nitrite pptn. methods gave good results, but the classic nitrate fusion method gave far superior results. Er material of high purity was prepd. by this method. The ratio  $\text{Er}_2\text{O}_3 : 2\text{ErCl}_3$  was found to vary with the temp. and length of ignition of the oxide.  $\text{Er}_2\text{O}_3$  prepd. by ignition of the oxalate and ignited for several hrs. at nearly  $800^\circ$  and 2 hrs. at nearly  $900^\circ$  was found to retain  $\text{CO}_2$ . This is contrary to Hofmann (*C. A.* 5, 254) and brings into dispute the accepted at. wt.

A. R. M.

**Preparation and properties of yttrium mixed metal.** J. F. G. HICKS. *J. Am. Chem. Soc.* 40, 1619-26(1918).—The "mixed metal" was prepd. by decompn. of the anhydrous chlorides *in vacuo* by Na and by electrolysis of the fused chlorides. Electrolysis of the soln. of the oxides in fused cryolite was less efficient. Loss of  $\text{YtCl}_3$  by volatilization was demonstrated. The metal was obtained in coherent form by sintering the metal powder *in vacuo*. The sintered metal was blue-gray, of low luster, soon tarnished by air, decompd. warm water rather rapidly, and reacted violently with dil. acids. The metal disintegrated in time to a powder, especially if exposed to air. These properties made impossible a satisfactory metallographic study. A. R. MIDDLETON.

**Zirconyl basic chromate.** F. P. VENABLE AND L. V. GILES. *J. Am. Chem. Soc.* 40, 1653-6(1918).—Soln. of  $\text{Zr}(\text{OH})_4$  in hot dil. soln. of  $\text{CrO}_3$  followed by diln. and

boiling gives a yellow ppt. approx.  $2\text{ZrO}(\text{OH})_2 \cdot \text{ZrO} \cdot \text{CrO}_3 \cdot 8\text{H}_2\text{O}$ . The results appear to controvert Haber (*Monatsh.* 18, 667(1897)).

A. R. MIDDLETON.

**Scandium from a Brazilian source.** C. JAMES. *J. Am. Chem. Soc.* 40, 1674 (1918).—Sc was conclusively identified in Brazilian  $\text{ZrO}_2$ . Other Zr minerals will be investigated.

A. R. MIDDLETON.

**Basic carbonates of copper.** H. B. DUNNICLIFF AND S. LAL. *J. Chem. Soc.* 113, 718–22(1918).—In 13 samples of com. Cu carbonate CuO was found to vary from 66.16 to 78.60%, controverting the statement of Pickering (*C. A.* 4, 29) that com. carbonate has a formula identical with that of malachite in which  $\text{CuO} = 71.94\%$ . The low values were proved not due to adsorption of water. Five samples containing  $\text{CuO} = 69.55\text{--}71.71\%$  were found to contain  $\text{CO}_2 = 17.35\text{--}18.1\%$ , much below the requirement for malachite or azurite. It is concluded that the com. carbonate is a mixt. of very varying compn. Attempts to prep. a carbonate of definite compn. gave products in which CuO varied from 71.08 to 78.85% according to conditions of prepn. By maintaining definite conditions products of nearly the same compn. were obtained and these approximated closely to  $2\text{CuCO}_3 \cdot 5\text{Cu}(\text{OH})_2$  or  $7\text{CuO} \cdot 2\text{CO}_2 \cdot 5\text{H}_2\text{O}$ .

A. R. MIDDLETON.

**The equilibrium between carbon monoxide, carbon dioxide, sulfur dioxide and free sulfur.** J. B. FERGUSON. *J. Am. Chem. Soc.* 40, 1626–44(1918).—A careful study is made in this paper of the reaction  $\text{CO} + \frac{1}{2}\text{SO}_2 \rightleftharpoons \text{CO}_2 + \frac{1}{2}\text{S}_2$ . The latter two products are formed between  $1000^\circ$  and  $1200^\circ$  together with possibly traces of COS in mixtures rich in CO. Equil. constants for these temps. have been detd. from which calcns. are made for the constants up to  $1500^\circ$  with the aid of the free-energy equation of the reaction and of  $\text{SO}_2$  from its elements. A semi-stream method is found to avoid errors in the original stream method. App., including a *constant-temp. elec. resistance furnace*, and methods of analysis of the mixed gases are fully described.

G. L. CLARK.

Crystal structure of the alums and the role of the water of crystallization (VEGARD, SCHJELDERUP) 3.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**The quantitative analysis of small quantities of gases.** H. M. RYDER. *J. Am. Chem. Soc.* 40, 1656–62(1918).—This method involves the freezing out of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapor by means of liquid air and solid  $\text{CO}_2$ , addition of O and combustion of the dry gases remaining, and redetn. of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  vapor. By it  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ , CO, O, H, N and  $\text{CH}_4$  can be detd., but not O and  $\text{CH}_4$  in presence of each other. When the total amt. of sample was less than 5 cu. mm., an av. analysis shows a max. error of 6% in the element present in the greatest quantity. Much greater accuracy is obtained with larger quantities.

IRENE F. SMITH.

**Simple method for determining sulfur dioxide.** G. W. JONES, J. H. CAPPS AND S. H. KATZ. *Mining Sci. Press* 117, 415–8(1918).—The authors describe in detail, with graphs and an illustration, a method and app. for detg.  $\text{SO}_2$  by I titration for the use of engineers working in the field. The app. is strong, cheap, easily replaceable, and assembled into a case designed for portability. The method is not accurate beyond 2 significant figures, but has a range of about 10 parts per mil. by vol. to 1% or more. With the aid of a table giving the effect upon the senses of varying concns. of  $\text{SO}_2$ , it is possible to est. the small proportions of  $\text{SO}_2$  without analysis. Cf. WELLS *et al.*, *C. A.* 10, 436.

F. W. SMITHER.

**Zirconium content in ores and alloys.** J. D. FERGUSON. Detroit. *Eng. Mining J.* 106, 793-4(1918); cf. *C. A.* 12, 2075.—The procedure for Zr steel differs from that described in the previous paper in the following details: After dissolving in HCl and  $\text{HNO}_3$ , add 6 cc. of  $\text{H}_2\text{SO}_4$  before evapg. After washing the  $\text{SiO}_2$  ppt. with hot  $\text{H}_2\text{O}$ , wash with HCl (1:1) and then again with hot  $\text{H}_2\text{O}$ . Instead of weighing the ppt. after ignition, treat directly with  $\text{H}_2\text{SO}_4$  and HF; evap. only to the appearance of  $\text{SO}_2$  fumes, dil. the residue and add to the main filtrate. Treat with 6 cc. of  $\text{NH}_4\text{HSO}_4$  soln. instead of  $\text{Na}_2\text{S}_2\text{O}_3$ ; cool, and neutralize with  $\text{NH}_4\text{OH}$  (1:1). Acidify with 10 drops of concd. HCl if the Zr is to be pptd. with  $\text{PhNHNH}_2$ , or with 2 cc. of concd.  $\text{H}_2\text{SO}_4$  if it is to be pptd. as phosphate. For the former, add 1 cc. of  $\text{PhNHNH}_2$  per 100 cc., boil, let stand 30 min., filter and wash with hot  $\text{H}_2\text{O}$ . Redissolve the ppt. in hot dil. HCl and  $\text{H}_2\text{SO}_4$ , reduce with 1 cc. of  $\text{NH}_4\text{HSO}_3$ , neutralize and proceed as before. This frees the Zr and Al from Fe. The final sepn. can be made by fusing with  $\text{Na}_2\text{CO}_3$ , filtering, igniting the insol.  $\text{Na}_2\text{ZrO}_4$  and fusing it with  $\text{K}_2\text{S}_2\text{O}_7$ , dissolving and pptg. as  $\text{Zr}(\text{OH})_4$ . It is then ignited and weighed as  $\text{ZrO}_2$ . Or the sepn. can be effected by the use of "cupferron" as follows: Dissolve the hydroxides in 40 cc. of hot HCl (1:1), dil. to 100 cc., cool and add a 6% soln. of cupferron till the Zr is pptd., then in excess ( $1\frac{1}{2}$  the total vol.). Let stand 15 min., filter, wash with cold dil. HCl (1:5), followed by  $\text{H}_2\text{O}$ ,  $\text{NH}_4\text{OH}$  and again by  $\text{H}_2\text{O}$ . Ignite and weigh as  $\text{ZrO}_2$ . The  $\text{PhNHNH}_2$  and phosphate methods agree very closely, generally within 0.05%. IRENE F. SMITH.

**The determination of tin in high grade wolfram ores and the use of lead as a reducing agent in Pearce's assay.** A. R. POWELL. *J. Soc. Chem. Ind.* 37, 285-87(1918).—The aqua regia method of detg. Sn in wolfram ores gives good results but is slow, as are also the method of fusion with KCN and the sepn. by means of Na tungstate and stannate. P.'s method is not only rapid but also gives good results. He fuses the ore with bisulfate, adds tartaric acid, filters and fuses the ppt. with  $\text{Na}_2\text{O}_2$ . The presence of Cu, Bi or Mo necessitates previous treatment of the ore with  $\text{HNO}_3$ . Instead of reducing the  $\text{SnCl}_4$  soln. with Fe and titrating with I, P. reduces with Pb which gives a more accurate end point, due to yielding a colorless soln. after reduction. I. F. S.

**The spectroscopic determination of lead in copper.** C. W. HILL AND G. P. LUCKEY. *Bull. Am. Inst. Mining Eng.* 142, 1581-92(1918).—The present paper deals with the development of the previously reported method (*C. A.* 12, 31) in the factory, giving the details of app. and its standardization, and presenting a comparison of the accuracy of the method with that of the standard electrolytic detn. The advantages claimed are facility and accuracy. The analyses can be made in the refining plant by the foreman, and the process of refining can be followed rapidly, without holding the furnace for a chem. analysis. Illustrations, curves, and tables are given. F. W. SMITHER.

**The iodometric determination of copper.** I. M. KOLTHOFF. Utrecht. *Pharm. Weekblad* 55, 1338-46(1918).—It was found by Moser (*Z. anal. Chem.* 43, 597-616 (1904)) that in the de Haen titration of Cu with KI, the results are too low if the soln. is acidified with HCl instead of  $\text{H}_2\text{SO}_4$ . This he ascribed to the soly. of CuI in HCl; but K. considers it much more probable that the effect is due to formation of complex compds. of the  $\text{Cu}^{++}$  ion with HCl. Expts. showed that the soln. can be titrated immediately after adding KI. The same results are obtained in neutral as in acid soln., but the titration is much slower. Dilg. the soln. does not affect the results; but, as in neutral soln., the titration is slower. In the KCNS modification, the manner of adding the reagents is important; if KI and KCNS are added to a neutral soln. of  $\text{CuSO}_4$ , the liberated I oxidizes some KCNS to HCN and  $\text{H}_2\text{SO}_4$ , causing low results. But if the KI and acid are added before the KCNS, and the soln. is then titrated at once, this error is avoided. Either HCl or  $\text{H}_2\text{SO}_4$  may then be used. The larger the amt. of KCNS, the more rapid is the titration; but if much is present, a slight error is introduced

owing to lessened sensitivity of the starch iodide reaction. For greatest rapidity, the soln. should be very dil. and should contain about 20 cc. of 25% KCNS soln. per cc. of  $N$  KI used. A correction of 0.05 cc. of 0.1  $N$   $Na_2S_2O_3$  should then be added. This method gives excellent results in sugar detns., and is much cheaper than the old method without KCNS. It can be used to advantage to det. sugar in milk directly, without prepg. the serum. Neither the old method nor the KCNS modification is applicable in the presence of Fe; but this, if present as  $Fe^{+++}$ , can be rendered harmless by adding  $Na_2P_2O_7$ . Or, addition of NaF causes the formation of  $Na_3FeF_6$ , in which form Fe does not liberate I. The titration can then be carried out as usual.

JULIAN F. SMITH.

**Volumetric estimation of zinc by acidimetric titration.** R. HOWDEN. *Chem. News* 117, 322(1918).—The Zn should be present as  $ZnCl_2$ , and the soln. should be free from salts of other heavy metals or  $NH_4$ . Evap. to small vol. (to expel free acid), dil. to 20 cc., add 1 drop of Me-orange soln. and carefully neutralize with 0.1  $N$  NaOH soln. Add a few drops of phenolphthalein soln. and titrate the combined acid with 0.1  $N$  NaOH soln. The end-point is indicated by a pink color which does not disappear on boiling the soln. Standardize the NaOH against a soln. of known concn. prepd. from pure Zn. The  $Zn(OH)_2$  ppt. does not interfere. "Expt. shows that absolutely concordant results can be obtained." No results are reported. F. W. SMITHER.

**Analysis of commercial zinc.** L. BERTIAUX. *Ann. chim. anal.* 23, 161-9, 181-91 (1918).—A detailed account, with illustrations of app., of the methods used in the lab. of the French Metals Co. **Sampling:** Use the largest no. of slabs practicable, boring completely through each, grinding the borings in a bronze mortar, and then mixing; or, saw through each slab and pass a magnet over the sawings. The final sample weighs 500 to 700 g. **B.** gives tables showing the irregularities (segregation) of the Pb content of 2 lots of Zn. **Detn. of Pb:** Treat 10 g. of the sample with 100 cc.  $Cu(NO_3)_2$  (made by treating 100 g. of pure electrolytic Cu with 500 cc. of 36° Bé.  $HNO_3$  and dilg. to 1 l.), 100 cc.  $H_2O$ , and 62 cc.  $HNO_3$  (36° Bé.); boil a min. to expel nitrous vapors, dil. to 300-350 cc., and electrolyze with a current of 0.3 amp. **Detn. of Fe:** In a 500-600-cc. erlenmeyer treat 25 to 50 g. of the metal (previously tested with a magnet) with concd.  $H_2SO_4$  (1 cc. for each g. of sample + an excess of 5 cc.), dilg. progressively to  $\frac{1}{8}$  strength. When the action abates (if too slow, add 2 drops of 50%  $NiSO_4$  soln.), heat till all dissolves, then boil a few min.; cool, filter through a wad of cotton, wash, and titrate with  $KMnO_4$  (1 cc. = 0.001 g. Fe). This gives the approx. amt. of Fe; if this exceeds 0.002, dil. to a known vol., transfer an aliquot containing not over 0.002 g. Fe to a cylinder, add 2 cc.  $HNO_3$  (36° Bé.), then 30 cc. of  $NH_4CNS$ , dil. to 500 cc. and det. Fe colorimetrically. **Tin:** To 50 g. of the Zn in a 600-cc. beaker add 60 cc.  $H_2O$ , then portionwise 191 cc.  $HNO_3$  (36° Bé.), warm, dil. to 450-500 cc. with boiling  $H_2O$ ; add several cc. of  $NH_4NO_3$  soln., boil several min., let settle (no turbidity indicates absence of Sn); filter, wash with hot 10%  $HNO_3$  till Zn-free, then with hot  $H_2O$ , ignite, and weigh as  $SnO_2$  (may contain Sb), and use factor 0.76 for Sn (theory = 0.7881). For an exact detn., fuse the  $SnO_2$  in a porcelain crucible with  $Na_2CO_3$  + S, cool, dissolve in warm  $H_2O$ , filter, and wash with  $H_2O$  + a few drops of  $Na_2S$  soln. To the filtrate and washings, add 10 cc. of 50%  $(NH_4)_2SO_4$  soln., evap. to dryness, take up with  $HNO_3$  and 5 cc. of  $H_2SO_4$  (1:2); evap. again to dryness to eliminate the S. Let cool, add  $H_2O$ , then 4 cc. HCl and 20 g. of  $(NH_4)_2C_2O_4$ ; warm to dissolve, dil. to 200 cc. and pass a current of  $H_2S$  for 1.5 hrs. through the nearly boiling soln. Filter rapidly on a filter impregnated with  $(NH_4)_2SO_4$ , and wash with hot  $H_2O$  (+  $H_2S$  and  $(NH_4)_2SO_4$ ). Heat the filtrate to expel  $H_2S$ , oxidizing the last traces with  $H_2O_2$ ; add 20 cc. concd. HCl, then 10 g. of  $(NH_4)_2C_2O_4$ , dil. to 300-350 cc., and electrolyze at about 40° with a current of 1 to 2 amp. In the presence of Sb the Sn may be sepd. in the detn.

of Cd. *Copper*: Treat 10 g. of Zn with 100 cc.  $H_2O$ , 15 cc. concd.  $H_2SO_4$ , and 25 cc.  $HNO_3$  ( $36^\circ B\acute{e}$ .), finally warming; dil. to 300–350 cc. and electrolyze (1 amp.). With very small amts. of Cu, after washing the deposit, redissolve in a little  $HNO_3$ , evap., add  $H_2O$  and  $NH_4OH$ , and det. colorimetrically. *Cadmium*: In a 700–800 cc. erlenmeyer, attack 25 to 50 g. of the sample with concd.  $H_2SO_4$  (1 cc. per g. of Zn + 15 cc. excess), dilg. progressively to  $\frac{1}{4}$  strength (adding previously, if necessary, 2 or 3 drops of 50%  $NiSO_4$  soln.); boil to complete soln. of the Sn (a residue of metallic Pb and Cd remains). Dil. to 500 cc., pass  $H_2S$  through for 30 min., filter, wash with satd.  $H_2S$  soln. containing 3% by vol. of concd.  $H_2SO_4$  to remove Zn (if Sn is to be detd. at this stage, treat the ppt. with warm  $NH_4HS$ , wash with satd.  $H_2S$  soln.; evap. the filtrate and washings to dryness in porcelain on a sand bath, take up with concd.  $HNO_3$ , add 5 cc.  $H_2SO_4$  (1:2), evap. again, and proceed as under Sn above). Dissolve the impure CdS in boiling  $HNO_3$  (1:2), then aqua regia, boil, and add hot  $H_2O$ , receiving the solns. in a porcelain dish; add 5 cc.  $H_2SO_4$ , evap. on sand bath until all  $SO_3$  fumes are expelled, take up with a measured amt. of  $H_2SO_4$  (1:10), heat to dissolve sol. sulfates; filter, wash with a known vol. of  $H_2SO_4$  (1:10); dil. the filtrate and washings to a content of 3%  $H_2SO_4$  by vol., pass  $H_2S$  through for 30 min. (the CdS will contain Cu, As, Sb, and Sn sulfides, unless the 3 latter were removed as above). Filter, wash with 3% (by vol.)  $H_2SO_4$ , then with  $H_2S$  water; treat the ppt. on the filter and in the pptg. vessel with a mixt. of 20 cc. of  $NH_4HS$  + 20 cc. of 20% KCN soln., then with  $H_2S$  water to remove KCN. Redissolve in hot  $HNO_3$  (1:2), then with hot aqua regia (1:2), and wash with boiling  $H_2O$ . Add to the united solns. 5 cc.  $H_2SO_4$  (1:2), evap. on sand bath until  $SO_3$  fumes disappear, cool; add  $H_2O$ , warm to complete soln., neutralize with NaOH soln., add 40 cc. of an 18% alc. NaOH soln., then 40 cc. of 20% KCN soln., dil. to 300 cc. and electrolyze (0.4 amp.). *Arsenic*: To 25 g. of the Zn (covered with  $H_2O$ ), in a l. casserole covered with a funnel, add portionwise 102 cc.  $HNO_3$  ( $36^\circ B\acute{e}$ .); after action ceases, add 31 cc. concd.  $H_2SO_4$ ; mix, evap. on sand bath to complete disappearance of  $SO_3$  fumes. Transfer the dry sulfates to a flask, add 15 g. of  $FeSO_4 \cdot 7H_2O$ , then 150 cc. concd. HCl and distil  $AsCl_3$  in the usual manner. Neutralize the distillate with satd.  $Na_2CO_3$  soln., acidify with HCl, add  $NaHCO_3$ , and titrate with I soln., using 5 cc. of a 1% starch soln. as indicator. Or, transfer the distillate to a flask, dil. to 250 cc. with  $H_2O$  and titrate cold with  $KBrO_3$  soln. (0.7427 g. per l.; 1 cc. = 0.001 g. As) until methyl orange (2 drops of 1% soln.) is decolorized. *Antimony*: Transfer the residue in the distn. flask from the As detn. to a round-bottom l. flask, add 250 cc.  $ZnCl_2$  soln. (d. 2.0) and 5 g. of  $(CO_2H)_2$  and distil  $SbCl_3$  in a current of  $CO_2$ . Neutralize the distillate with  $NH_4OH$ , acidify slightly with dil.  $H_2SO_4$ , pass in a current of  $H_2S$ ; filter, wash with satd.  $H_2S$  soln.; dissolve the  $Sb_2S_3$  in NaHS soln. (d. 1.22–1.225), wash 2 or 3 times with tepid NaHS soln. Add 20 cc. of 20% KCN soln., mix, and electrolyze (0.5 amp.). *Sulfur*: Det. by evolution method, treating 20 g. of the Zn with 200 cc.  $H_2SO_4$  (1:10) and 25 cc. HCl and absorbing the  $H_2S$  in ammoniacal  $AgNO_3$  soln. (10 cc. of a  $AgNO_3$  soln. containing 10 g. Ag per l. + 25 cc.  $NH_4OH$  of  $22^\circ B\acute{e}$ ., dild. to 50 cc. with  $H_2O$ ). A current of  $CO_2$  is passed through the system during the operation. Filter off the  $Ag_2S$ , wash with  $H_2O$  +  $NH_4OH$ , ignite, and weigh;  $Ag \times 0.1481 = S$ . *Carbon*: Use 5 g. of sample. Det. by  $CrO_3$ - $H_2SO_4$  wet combustion method, using the app. previously described (cf. C. A. 8, 35), except slightly moist granulated KOH is used as an absorbent. Tables are given showing the analyses of several varieties of French and American Zn.

F. W. SMYTH.

The evaluation of zinc dust: a proposed method of analysis. L. A. WILSON. *Chem. Met. Eng.* 19, 32–4 (1918).—A modification of the Meyer method (SCOTT, "Standard Methods of Chemical Analysis." The chief departures are the use of strong acid and the addition of  $FeSO_4$  and a small piece of sheet Pt, the latter 2 acting as catalysts. To

simplify calcn., a correction tube of dry H over Hg, inverted in a cylinder of Hg, can be used. After detg. the vol. of H in this tube, pure  $H_2O$  is let in and the vol. read again at equil. The % of metallic Zn is then  $(V_D \times V_s \times 0.29196) / V_d$ , where  $V_D$  is vol. of gas evolved in the detn.,  $V_s$  is vol. of dry H in the correction tube at standard conditions, and  $V_d$  is the vol. of the same H over  $H_2O$ , read under the same conditions as the H evolved. The factor is due to the fact that the vapor pressure of  $H_2O$  over 10%  $H_2SO_4$  is lower than over pure  $H_2O$ .

IRENE F. SMITH.

**Rapid method of estimating phosphorus in bronzes.** T. E. ROONEY. *Inst. Metals*, Sept. 11, 1918; *Engineering* 106, 332 (1918).—Dissolve in a 600-cc. erlenmeyer 0.5 to 2 g. of bronze in a mixt. of 20 cc. concd.  $HNO_3$  and 10 cc. concd.  $HCl$  (or 60 cc.  $HNO_3$  (d. 1.135) + 10 cc. concd.  $HCl$ ), and heat, without boiling, until most of the red fumes have been evolved. (If the concd. acids are used dil. to about 70 cc.) Cool, add slowly with const. shaking 40 cc.  $NH_4OH$  (d. 0.96), then 35 cc. of molybdate soln., and shake well for a few min. Let stand until the ppt. settles out (1 to 2 hrs.), filter on pulp, wash acid-free with  $H_2O$ , transfer the filter and ppt. to the flask, add excess of 0.05 N  $NaOH$  soln. and titrate back with 0.05 N  $H_2SO_4$ , using phenolphthalein as indicator. *Notes:* The digestion with acid must be long enough to oxidize all the P, or the results will be low. Boiling or heating must not be too prolonged or Sn will be pptd. and will be difficult to redissolve. A table is given showing the compn. of com. bronzes and the results obtained by the above volumetric method and the usual gravimetric method. The results by the 2 methods show excellent agreement. F. W. SMITHER.

**A method for the colorimetric estimation of cobalt.** E. G. JONES. Univ. Liverpool. *Analyst* 43, 317-9 (1918).—It is possible to est. 0.01-0.1% Co in materials such as varnish and ZnO-paints. Incinerate a weighed quantity of varnish in a porcelain crucible and ext. the ash with concd.  $HCl$ . If any insol. matter remains, add aqua regia followed by  $HCl$  to remove  $HNO_3$ . Evaporate to dryness, dissolve in hot  $H_2O$  with the addition of a few drops dil.  $HCl$  and dil. the soln. to a convenient vol. Transfer an aliquot to a Nessler cylinder, add 5 cc.  $NH_4$  citrate (dissolve 500 g. citric acid in 250 cc.  $H_2O$  and add 500 cc.  $NH_4OH$  (d. 0.880); this is not a neutral soln., but contains excess  $NH_3$ ). Dil. the mixt. nearly to 100 cc., add 5 cc.  $\alpha$ -nitroso- $\beta$ -naphthol soln. as prepared by Attack (*J. Soc. Chem. Ind.* 34, 641-3; *C. A.* 9, 2363). Mix the contents of the cylinder, then match against different amts. of standard soln. of Co to which have been added the same amts. of  $NH_4$  citrate and  $\alpha$ -nitroso- $\beta$ -naphthol as used with the sample. The amts. of free  $NH_3$  should be nearly the same in all solns. compared. The most satisfactory amt. of Co for comparison is about 0.1 mg. Varnishes to which were added the following % amts. of Co: 0.0095, 0.039, 0.066, 0.072, 0.0104, 0.180, showed 0.009, 0.037, 0.062, 0.070, 0.103 and 0.178, resp. The mineral matter in these consisted mainly of  $Fe_2O_3$  with traces of  $SiO_2$  and Pb and sometimes minute traces of Cu and Mn. Modifications are necessary in presence of Cu (except in minute traces of Ni or of Mn). Remove Cu by  $H_2S$ , having the acidity of the soln. about 0.05 N with  $HCl$ . Filter, and remove excess  $H_2S$  from the filtrate by boiling. There is serious interference caused by Ni unless the amt. present is much smaller than that of Co. Add a few cc.  $NH_4$  citrate soln. to the neutral or slightly acid soln., dil. to about 100 cc. with  $H_2O$  and heat nearly to boiling. Add 1% soln. dimethylglyoxime ( $EtOH$  soln.), about 1 cc. for every 2 mg. Ni, then  $NH_4OH$  drop by drop until slightly alkaline. Stir, allow to stand 5 min. in a warm place, filter and wash with hot  $H_2O$ . Dil. the filtrate to a convenient vol., transfer an aliquot to a porcelain dish, evap. to dryness and gently ignite. Treat the residue first with aqua regia, then with concd.  $HCl$ , and evap. to dryness. Add a drop of dil.  $HCl$ , ext. with  $H_2O$  and det. Co in the usual way. If the amt. of Mn present is very considerably greater than that of Co, it must be removed, not necessarily completely, but in greater part. To the soln. contg.

the metals as chlorides, add about an equal vol. of  $\text{HNO}_3$  (d. 1.2), and a small quantity of sodium bismuthate. Digest on a hot plate until the permanganate color disappears and the Mn is pptd. Filter, make up to a suitable vol., transfer an aliquot to a Nessler cylinder. Add 5 cc. neutral  $\text{NH}_4$  citrate, neutralize the liquid with  $\text{NH}_4\text{OH}$  (litmus) and add a measured quantity of  $\text{NH}_4\text{OH}$  (about 10%  $\text{NH}_3$ ). Match the color against a standard Co soln. to which has been added the same amts. of neutral  $\text{NH}_4$  citrate,  $\text{NH}_4\text{OH}$  and  $\alpha$ -nitroso- $\beta$ -naphthol. The procedure for ZnO-paints is similar to that employed for varnishes. Specimens to which were added 0.063 and 0.114% Co, resp., showed 0.063 and 0.103% by this method. H. M. LANCASTER.

**Determination of chromic oxide in chromite.** W. C. RIDDELL AND E. KITTRIDGE. *Mining Sci. Press* 117, 558-9(1918).—Based on exptl. data reported, the following method was developed for the rapid detn. of  $\text{Cr}_2\text{O}_3$  in ores and mill products submitted for analysis in connection with the War Minerals Investigation, being conducted by the U. S. Bureau of Mines. Transfer 0.5 g. of the ore (100-mesh) to a 20-cc. spun-Fe crucible containing 4 to 5 g. of  $\text{Na}_2\text{O}_2$ , mix thoroughly by stirring with a glass rod, cover with a little  $\text{Na}_2\text{O}_2$ , and fuse at a red heat. After the charge has melted, it should remain in the molten condition for 5 min. Let cool, place in a 400-600-cc. beaker, add about 100 cc. of  $\text{H}_2\text{O}$  and digest until the fused mass has disintegrated, after which remove and rinse the crucible; boil for at least 5 min. to decompose the  $\text{Na}_2\text{O}_2$ ; without filtering, neutralize the soln. with  $\text{H}_2\text{SO}_4$  (1:4) and add 25 to 30 cc. excess. Dil. to 300 to 400 cc. with cold  $\text{H}_2\text{O}$ , add about 0.2 N  $\text{FeSO}_4$  soln. in slight excess and titrate back with 0.2 N  $\text{K}_2\text{Cr}_2\text{O}_7$  soln., using  $\text{K}_2\text{Fe}(\text{CN})_6$  as an outside indicator. About 40 detns. can be run in 8 hrs. When Fe, as well as Cr, is to be detd. a heavy 20-cc. porcelain crucible should be used. When the fusion is made over a burner, the crucible should be covered and care exercised to avoid spattering; with a muffle, no cover is necessary. F. W. SMITH.

**Determination of nitrates in caliche and its products.** J. E. CLENNELL. *Eng. Mining J.* 106, 660-3(1918).—A modification of the Pelouze method for the detn. of nitrate in caliche is described. The author finds that  $\text{FeSO}_4$  is not easily oxidized by the atm., as is commonly supposed. Prolonged boiling of caliche with  $\text{FeSO}_4$  does not completely oxidize the  $\text{Fe}^+$  to  $\text{Fe}^{++}$  unless the mixt. contains a considerable concn. of  $\text{H}_2\text{SO}_4$ . When chlorides are present in the caliche, they also are reduced, causing high results. They also reduce  $\text{KMnO}_4$  in the final titration unless the decomposed sample is sufficiently dild. A standard soln. of  $\text{FeSO}_4$  with the necessary amt. of free  $\text{H}_2\text{SO}_4$  does not keep owing to the formation of an insol. ppt. C. advises a soln. only slightly acidified. Since the boiling cannot be hurried, a detn. requires about 45 min. IRENE F. SMITH.

**The determination of hypochlorites and chlorates in presence of each other.** I. M. KOLTHOFF. *Utrecht. Pharm. Weekblad* 55, 1289-95(1918).—In detg.  $\text{HOCl}$  by oxidation of  $\text{As}_2\text{O}_3$ , the drop test on KI-starch paper can be avoided by direct use of indigo, or better still, methyl red in the acid soln. The titration can be carried out in either  $\text{HOAc}$  or  $\text{HCl}$  soln., without any interference by chlorates. Contrary to the  $\text{HOCl}$  detn., indigo is a better indicator than methyl red for titrating chlorates. The best procedure is to add 10 cc. of 39%  $\text{HCl}$  and 10 cc. of sample to 25 cc. of 0.1 N  $\text{As}_2\text{O}_3$ , boil gently for 5 min., and titrate the excess of  $\text{As}_2\text{O}_3$  with 0.1 N  $\text{KBrO}_3$ . In com. bleaching powder, low available Cl is more often due to faulty packing or shipping, allowing the material to get wet, than to fraudulent adulteration. This can usually be decided by detg. both the hypochlorite and the chlorate content before shipping and after receiving. The loss of available Cl will appear as increase of chlorate. The strength of Cl water is readily detd. by the method described above for hypochlorites. JULIAN F. SMITH.



The separation of germanium from arsenic by the distillation of the chloride in the presence of a chromate. P. E. BROWNING AND S. E. SCOTT. *Am. J. Sci.* 46, 663-5(1918).—A modification of the method previously reported (*C. A.* 11, 3190). The distn. flask consisted of a 75-cc. Pyrex Erlenmeyer beaker fitted with a 2-hole rubber stopper; through one opening was inserted a bent glass tube, the other end of which dipped just below the surface of 3 cc. of  $H_2O$  in a test tube immersed in ice- $H_2O$ ; through the second opening another tube was inserted so as to have its end about 1 cm. below the surface of the liquid to be distd. This tube is connected through a wash bottle with a  $CO_2$  generator. Place the mixt. to be distd. in the flask, add 5 cc. of 10%  $K_2Cr_2O_7$  soln. and a few drops of  $H_2SO_4$ ; warm about 1 min., add 10 cc. concd.  $HCl$ , and distil in a current of  $Cl_2$  to about half its vol.; cool in  $CO_2$ , and ppt.  $GeS_2$  in the distillate with  $H_2S$ . Exptl. results reported show that 0.0005 g.  $GeO_2$  can be readily detected when present with 0.1 g.  $As_2O_3$ .  
F. W. SMITHER.

Separating barium from strontium. J. WADDELL. *Mining Sci. Press* 117, 495-6 (1918).—To 50 cc. of the neutral soln. (equiv. to 0.3 g. of  $BaCl_2 \cdot 2H_2O$ ) in an erlenmeyer, add 10 cc. 30%  $AcONH_4$  soln., heat to boiling, and, while giving the flask a swirling motion, add 5 cc. 10%  $(NH_4)_2Cr_2O_7$  soln. Boil for 1 min., cool, filter through a Gooch crucible, and wash with cold  $H_2O$  + a few drops of the  $AcONH_4$  soln. Dissolve the ppt. by pouring through the crucible as little hot 1:1  $HNO_3$  as will serve the purpose, alternating with hot  $H_2O$ , and receiving the solns. in the original erlenmeyer; wash free of acid, dil. to about 50 cc., and heat to boiling. Add dil.  $NH_4OH$  until a permanent but not abundant ppt. forms, then add 10 cc. 30%  $AcONH_4$  soln. and 5 cc. 10%  $(NH_4)_2Cr_2O_7$  soln.; boil for about 1 min., cool, and filter as described. Dissolve the  $BaCrO_4$  in cold dil.  $HCl$  and det. Ba volumetrically as previously described (*C. A.* 12, 1445). In the sepn. of Ba from Sr in barite, if the amt. of Sr is known to be small one pptn. suffices. Cf. *C. A.* 12, 2175.  
F. W. SMITHER.

Detection and characterization of malonic acid. J. BOUGAULT. *Ann. chim. anal.* 23, 154-5(1918).—A résumé of a previous paper (*C. A.* 8, 478). B. reports the soly. in  $H_2O$  of the cinnamylidene compd. as 0.02%, and suggests this correction in quant. detns. The disadvantage in the use of Ca malonate for the prepn. of the compd. is obviated by the addition of 0.5 g.  $AcONa$ .  
F. W. SMITHER.

The oxidizing action of potassium dichromate as compared with that of pure iodine. CARL R. McCROSKY. *J. Am. Chem. Soc.* 40, 1662-72(1918).—Analytical reactions of  $K_2Cr_2O_7$  were studied to det. its status as an analytical standard. Some samples liberate more I in the oxidation of HI than is indicated by the normal equiv. The removal of dissolved air by means of indifferent gases acts as a corrective of this. Varying results are due to such impurities in the  $K_2Cr_2O_7$ , as are not removed by crystn., crystn. alone not being sufficient to produce theoretical values. I. F. S.

Important change in a sodium thiosulfate solution. H. I. WATERMAN. Dordrecht. *Chem. Weekblad* 15, 1098-9(1918).—Although standard  $Na_2S_2O_3$  solns. usually keep for months, one was observed to change in 1 month from 0.923 to 0.981 N, and in 15 days more to 1.023 N (measured iodometrically), after which it remained const. The change is too great to have been caused by the presence of  $CO_2$ . The cause is not known, but the change indicates that old  $Na_2S_2O_3$  solns. are not to be relied upon.

JULIAN F. SMITH.

A new indicator of vegetable nature. C. MARINI. Torino. *Ann. chim. applicata* 19, 32-6(1918).—M. made a study of the coloring matter of the myrtleberry. The method of prepn. is as follows: Take 250 g. dry, very ripe berries of the myrtle well cleaned of stems and leaves, mix with 750 g. 90% alc., and heat under a reflux for 1 hr. Decant and filter. Add to the wine-red colored filtrate 1 cc. N alc. for every 200 cc.

liquid, and divide into 2 equal parts. Make 1 of these parts still more alkaline so that 10 drops of the tincture placed in a tube with 10 cc.  $H_2O$  give a green color with 1 or 2 drops of  $N$  alk. and then change to a carmine with 1 or 2 drops of  $N$  acid; the edges of the liquid will have a greenish color. Take the other half, make it alkaline with the same vol. of alkali as used with the 1st half, then acidify with 1 cc.  $N$  acid, producing a liquid having wine-red edges. Mix the 2 halves together. Divide again into 2 equal parts, add  $\frac{1}{2}$  cc.  $N$  acid to one part, and mix the parts together again. Divide into halves once more, make the 1st alkaline with the least possible amount of alkali that colors the edges green; acidify the 2nd with 0.1  $N$  acid till the edges are colored wine-red. Keep the 2 liquids sep. Immerse slips of paper in each. When dried, those from the alkaline liquid will be colored a beautiful green, while the acid liquid will produce slips of a Bordeaux-red color. Two drops of weak acid (0.005  $N$ ) will produce upon the green paper a carmine-red. Two drops of weak alkali (0.005  $N$ ) will change the Bordeaux-red paper to a dark green. The indicator is more sensitive than turnsole.

ROBERT S. POSMONTIER.

**Determination of albuminoid ammonia in liquids containing gas liquor.** H. F. STEPHENSON. *Analyst* 43, 213-4(1918).—Allowance must be made for the thiocyanate present. To a measured portion of the liquid (which should be alk.) add  $Al_2(SO_4)_3$  sufficient to give a decided ppt. Shake well, allow to stand for a few mins. and then filter under suction through ignited asbestos. Acidify the clear filtrate with dil.  $HNO_3$  and remove thiocyanate by means of  $AgNO_3$ . Transfer the final filtrate along with the asbestos filter and adhering ppt. to the distn. app., make alk. with  $Na_2CO_3$  and est. albuminoid  $NH_3$  in the usual way. Owing to  $AgCNS$  being slightly sol., the figures obtained as above are always too high by a small amt., which is practically const. A blank expt. with distd.  $H_2O$  to which a little thiocyanate has been added will det. the necessary correction once for all.

H. M. LANCASTER.

**New reaction of formic acid and bisulfites.** E. COMANDUCCI. Univ. Naples. *Boll. chim. farm.* 57, 101-2(1918).—C. has previously shown (*Rend. soc. chim.* 1904, No. 16) that  $HCO_2H$ , when gently heated with a concd.  $NaHSO_3$  soln., produces a characteristic yellowish red color which is not given by substances such as glycerol,  $AcOH$ ,  $MeOH$ , etc., in which  $HCO_2H$  occurs as an impurity; this test cannot be directly applied to a liquid which is red or yellow in color but may be made upon a distillate obtained by distg. the liquid in a current of  $CO_2$ . C. now finds that the test can be directly applied to such a colored liquid provided it is gradually heated with  $NaHSO_3$  to incipient boiling and is then cooled and treated with a dil., freshly prepd. soln. of Na nitroprusside;  $HCN$  is evolved and a more or less intense green or blue coloration, depending on the amt. of  $HCO_2H$  present, is produced. The test is rendered more sensitive by pouring the Na nitroprusside soln. on the 1st mixt. so as to form 2 layers; a green zone which soon turns blue and finally yields a blue ppt. is produced. Formates also give this color reaction. The latter is due to the reaction of Na nitroprusside with the  $Na_2S_2O_4$  produced by the reaction of  $NaHSO_3$  and  $HCO_2H$  or  $HCO_2Na$ . A concd., freshly prepd.  $Na_2S_2O_4$  soln., when mixed with a dil., freshly prepd. Na nitroprusside soln., causes evolution of  $HCN$  and  $SO_2$  and the production of a green or blue color with finally a blue ppt.; when  $Na_2S_2O_4$  is present in excess the liquid is colored dark red and then becomes blue with evolution of  $HCN$ . The above reaction is not produced when  $K_4Fe(CN)_6$  or  $K_3Fe(CN)_6$  is substituted for Na nitroprusside. The above blue ppt. had a compn. corresponding to  $Fe_2(CN)_4Na_4$ .

H. S. PAINE.

**Use of enzyme reagents. II. Detection of pyrimidone and differentiation of the naphthols.** LUCIANO P. J. PALET. *Anales. soc. quim. Argentina* 6, 250-7(1918); cf. *C. A.* 12, 1333.—A poorly defined violet-blue color was obtained after about 24 hrs. when a well washed root (containing oxidases and peroxidases) of *Medicago sativa*

was added to a soln. of pyramidone. The appearance of the color was hastened by also adding a few drops of  $H_2O_2$  but the intensity of color was not increased; when, in addition,  $\alpha$ -naphthol was added a distinct wine-red color was almost instantly produced. When  $\beta$ -naphthol instead of  $\alpha$ -naphthol was added there was produced a blue color which changed at once to yellow with greenish tints;  $\alpha$ - and  $\beta$ -naphthols may thus be differentiated and traces of  $\alpha$ -naphthol may be detected in the presence of a great excess of  $\beta$ -naphthol. Since pyramidone is usually present in excess in such cases a blue color first appears, but the pieces of alfalfa root gradually turn red if  $\alpha$ -naphthol is present. The color changes observed after 24 hrs. contact of (1)  $\alpha$ -naphthol + alfalfa root, (2) the preceding +  $H_2O_2$ , and (3) the immediately preceding + pyramidone were: (1) roots slightly blue, liquid colorless; (2) roots intense blue, liquid blue; (3) roots and liquid, intense red. The corresponding color changes when  $\beta$ -naphthol was substituted for  $\alpha$ -naphthol were: (1) no change; (2) roots slightly yellow, liquid colorless; (3) roots and liquid, orange. In toxicological examn. by the Stass-Otto method the ordinary tests for pyramidone are either not sp. or are masked, since most of the alkaloids and medicaments such as antipyrine and antifebrine are found in the same analytical group ( $Et_2O$  ext. of a soln. rendered alk. with  $NaOH$ ). The following procedure gave satisfactory results in the case of partially decompd. viscera containing an abundance of ptomaines and a minute amt. of pyramidone. A portion of the residue from evapn. of the alk.  $Et_2O$  ext. was dissolved in a small amt. of distd.  $H_2O$  and transferred directly to a test tube without filtering and without removal of fatty and resinous substances. A well washed portion of alfalfa root and 4-5 small crystals of  $\alpha$ -naphthol were added and the mixt. was shaken and allowed to stand; the root acquired a more or less intense red color. This color may be estd. by washing the root with distd.  $H_2O$  and shaking in alc.

H. S. PAINÉ.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

The dispersion of the optic axial angle of monoclinic feldspars. S. KÔZU. *Bull. soc. franc. min.* 40, 36(1917); *J. Geol. Soc. Tokyo* 25, 31-7(1918).—An equation is presented for determining the dispersion formula of the optic axial angle in monoclinic feldspars when  $V$  is large. The  $n_s$  computed from this formula are compared with the observed values, determined by the total-reflectometer.

S. G. GORDON.

Tear-figures on certain minerals. I, II. MIKIO KUHARA. *Mem. Coll. Eng. Kyoto Imp. Univ.* 1, 267-74, 279-86(1917).—Characteristics of the tear-figures on stibnite, galena, sphalerite, pyrite, vivianite, enargite, calcite, gypsum and barite are described.

J. H. B.

Radiation pattern of the transformation of magnesium hydroxide to magnesium oxide; serpentine, malachite, and pseudomorphous quartz; Bultfontein apophyllite; diamond tests by radiation patterns; diffraction from the edges of a square plate of iodine. J. S. V. D. LINGEN. *Trans. Royal Soc. S. Africa* 7, 59-63(1918).—A perfect piece of brucite showing the usual interference pattern without radial lines on transmitting Röntgen rays parallel to the trigonal axis, was heated over  $300^\circ$ . The mineral then showed only 6 radial lines, which increased in number, when exposed at room temperature, with no trace of the usual pattern. The displacement of the water mols. thus causes a displacement of the 3 principal points of the usual pattern, so that they become drawn out along radial lines, which seems to indicate a weakening of the lattice of the original homogeneous crystal, with a uniform displacement of the reflecting planes. A plate of Carolina (Transvaal) serpentine was placed so that the threads

were perpendicular to the incident rays, and exposed for 4 hours. The plate showed a pattern symmetrical about the direction of the threads, the radial lines parallel to the threads showing a greater intensity than the subordinate lines. This symmetry indicates that serpentine is not triclinic. Malachite cut parallel to the slightly radiating fibers showed three lines parallel to the threads, and a number of secondary lines perpendicular to the principal line. Quartz pseudomorphous after crocidolite showed an intense dispersion around the central spot, accompanied by thin radial lines, making a small angle in the direction of the threads, indicating that the substance is microcrystalline, and that the miniature crystals are so oriented that their normals to the reflecting planes favor the direction of the threads. The radial lines indicate the loci of the principal point pattern of the original crystal, and also give an indication of the stability of the lattice. A perfect and an imperfect apophyllite were successively irradiated normal to the cleavage plane. The imperfect crystal showed a discontinuity along the cleavage plane, indicating an irregular distribution of the intensity of the individual spot due to the irregularity caused by the cleavage cracks. A diamond twin showed the usual pattern, together with a similar one rotated through  $180^\circ$ . No discontinuity of the lattice was shown. A diamond with a black spot showed a slight discontinuity of some of the spots, but the lattice remained perfect. A spotted stone showed a ruptured lattice, the usual elliptic spots being represented by irregular discontinuous markings, spaced at various intervals. The diamond as a whole seems to consist of units more or less similarly oriented, each of which tends to produce its individual pattern. A 4 mm. square plate of I exposed for an hour normal to the diaphragm showed diffraction from the edges of the crystal. S. G. GORDON.

**Kimberley diamonds, especially cleavage diamonds.** J. R. SUTTON. *Trans. Royal Soc. S. Africa* 7, 65-96(1918).—A detailed description of the physical properties of the diamonds from the several S. African localities. The stones in any one pipe are remarkably uniform, but from one to another pipe they differ markedly in quality, size, crystallization, surface, color, general appearance, texture and tone. In addition to the gem diamonds, bort and "stewartite" also occur, the latter being a bort high in Fe, which is steel-gray, fibrous, equal in hardness to diamond, but lower in sp. gr., about 3.45, and also showing magnetic polarity. The explosive fracturing of diamonds is believed to be connected with the presence of inclusions having greater coefficients of expansion. Trade terms are discussed, and it is pointed out that "cleavages" includes not only broken fragments, but also mis-shapen stones that require cleaving before cutting. Statistics of production are included. S. G. GORDON.

**Pyrolusite from Virginia.** THOMAS L. WATSON AND EDGAR T. WHERRY. *J. Wash. Acad. Sci.* 8, 550-60(1918).—The geology of the Mn deposits near Woodstock, Va., is described in detail. A cryst. mineral having the physical properties of pyrolusite is abundant there. Two new analyses, by S. D. Gooch, are presented and compared with those of "pseudomanganite" from India. The  $MnO_2$  in all of them is over 92%, confirming the detn. as pyrolusite. An elaborate crystallographic study of the Va. mineral has been made, and the axial ratio proves to be close to that of some manganite, although there are 7 forms not heretofore noted on that mineral, and the habit is likewise unusual, being hemimorphic on the  $b$ -axis. The difference between the axial ratio and that usually accepted for manganite is perhaps connected with the loss of H, corresponding to the change into pyrolusite, taking place chiefly in the direction of the  $b$ -axis. On the other hand, the material may not be pseudomorphous at all, but represent primary pyrolusite, and further studies are to be undertaken to throw light on this question. E. T. W.

**Geology and ore-deposits of the Platoro-Summitville mining district, Colorado.** HORACE B. PATTON. *Colo. Geol. Survey, Bull.* 13, 122 pp.(1917).—The rocks of

this district are described petrographically, analyses of quartz-biotite latite, biotite-hornblende latite-vitrophyre, augite-andesite, and monzonite being given. The rocks show extensive alteration, to kaolinite, sericite, alunite, etc. There is considerable pyrite scattered through some of the altered rocks, and on weathering it gives rise to Fe sulfates, which yield a bitter taste to the surface waters; 4 analyses of these are given. From a complete analysis of an alunite-bearing rock, its mineral compn. is calcd. to be: alunite, 31.22; kaolinite, 43.33; quartz, etc., 25.57; sum 100.12%. The physiography and geology, and the individual mines are described in detail. At one locality covellite occurs in large amount, sometimes in good crystals over 2 inches across. The ore deposits appear to be due mostly to ascending waters, but the association of Au with limonite shows clearly that secondary concn. by meteoric waters has occurred.

E. T. W.

**Manganese ore in Georgia.** ANON. *Science* 48, 360-2(1918).—Examn. shows the existence of large reserves of both high-grade Mn ore and Mn-Fe ore. The high-grade ore of Cartersville contains about: Mn 42.0, Fe 6.0, SiO<sub>2</sub> 6.0, P o. 14 to o. 20%. The Mn-Fe ore of the district: Mn 15.0, Fe 20.0, insol. 30.0, P o. 17%. J. H. B.

**Two-phase convection in igneous rocks.** FRANK F. GROUT. *J. Geology* 26, 481-500(1918).—Based upon a study of the Duluth gabbro, the idea of a convection circulation in magmas is considered possible. This paper summarizes the signs of convection and suggests its probable mechanism and results. The forces necessary to start a current seem to be ample and are furnished in part by cooling and by the increase in d. of growing crystals which is probably more important than the development of any gas or separate liquid phases. The idea of convection is of practical service when related to the banded structure. By it the position of the walls of the chamber may be found. The complexity of some differentiated rock series may also be explained by assuming that some of the series developed during convection. W. F. HUNT.

**Notes on a collection of rocks from Honduras, Central America.** WILBUR G. FOYE. *J. Geology* 26, 524-32(1918).—A petrographic description of the igneous and metamorphic rocks from the province of Atlantida, northwestern Honduras, and from the Island of Utila. No chem. analyses are given. W. F. HUNT.

**The granite and its satellites in Mount Hiei environs.** TADASU HIKI. *Mem. Coll. Eng. Kyoto Imp. Univ.* 1, 275-8(1917).—It is concluded that the various rocks, erupted successively, resulted from differentiations of the same kind in different degrees, in a granitic magma chamber. It is also clear that the rocks of this group differ in only megascopic character and geological relation, but not in compn. nor in general community of character. Analyses and photomicrographs are given. J. H. B.

**Volume changes in metamorphism.** WALDEMAR LINDGREN. *J. Geology* 26, 542-55(1918).—Metamorphism is defined as the sum total of the chem. and mechanical changes which take place in solid rocks, below the zone of oxidation. The agents are heat, pressure, and chem. energy. It is believed that metamorphism by replacement does not normally involve changes in vol., as replacement proceeds particle by particle, though not mol. for mol. Replacement takes place, however, independently of sp. gr. and mol. vol. Replacement is dependent upon the velocity of the soln. movement, and upon compn., pressure and temp. of the replacing soln. A good proof that no vol. change takes place during metamorphism is furnished by the frequent preservation of the preëxisting texture and structure. In the case of the serpentinization of Mg rocks which is often cited as a case of expansion by replacement, it seems more probable that replacement has been effected with the removal of some magnesia; this contention is supported by the existence of ascending Mg waters where serpentine is abundant, as in Cal.

W. F. HUNT.

**The nature and origin of the stylolitic structure in Tennessee marble.** C. H. GORDON. *J. Geology* 26, 561-9(1918).—Stylolites are irregular, dark-colored, interlocking seams which resemble the sutures of the human skull. These structures consist of striated, tooth-like projections or columns which project from opposing surfaces along a plane of fracture. Apparently the most satisfactory explanation is that known as the soln. theory, unequal soln. along planes of fracture after the consolidation of the rock. Due to the weight of the overlying mass, soln. will take place more rapidly on the concave surfaces opposite the columns, causing these to penetrate into the opposing surfaces. W. F. HUNT.

**The depth of dolomitization.** FRANCIS M. VAN TUYL. *Science* 48, 350-2(1918).—Van T.'s experience with regional dolomites of undoubted secondary origin contains considerable evidence in support of the contention that many of the dolomites represent shallow water deposits. J. H. B.

**Metalliferous laterite in New Caledonia.** W. M. DAVIS. *Proc. National Acad. Sci.* 4, 275-80(1918).—Comprizes chiefly physiographic contributions to the historical geology of the island. J. H. B.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

**Recording experimental flotation tests.** A. F. TAGGART. *Eng. Mining J.* 106, 751-2(1918).—The author gives a form "devised to guide investigators in the Hammond lab. in the performance and recording of flotation test work."

F. W. SMITHER.

**Effect of oxygen on the precipitation of metals from cyanide solutions.** O. P. WATTS. *Chem. Met. Eng.* 19, 652-3(1918).—Discussion of a paper by Crowe (*C. A.* 12, 2183). In opposition to C.'s view that pptn. of Au is brought about by H which has been displaced by Zn, and that the removal of dissolved air is beneficial because it prevents oxidation and loss of this reducing agent, W. considers that the Au is directly displaced from soln. by Zn, just as the same metal displaces Cu from a soln. of  $\text{CuSO}_4$ . "Besides causing a loss of Zn, dissolved air lessens the efficiency of recovery by accelerating re-soln. of the Au already pptd., just as air aids the dissolving of metals in cyaniding ores. It is this 2-fold action that makes dissolved air a factor to be reckoned with in the economics of Au recovery."

F. W. SMITHER.

**Smelting and lead refining at the Bunker Hill plant.** C. T. RICE. *Eng. Mining J.* 106, 743-9(1918).—A detailed description, with numerous illustrations, of the design and operation of the blast furnaces, types of blowers used, the arrangements for Pb tapping, modes of conveyance of the various products about the plant, including the pumping, by centrifugals, of molten Pb. The details of the Parkes process, and the use of Faber du Faur furnaces in refining the products, are also described. The blast furnace charge carries 35 to 40% Pb and only 1 to 3% Zn. The slag analyzes FeO, 32; ZnO, 2 to 4;  $\text{SiO}_2$ , 32 to 33; CaO, 16; MnO, 3; Pb, 1%. F. W. SMITHER.

**Lead refining at the Bunker Hill plant.** C. T. RICE. *Eng. Mining J.* 106, 771-7(1918).—A detailed description, with illustrations, of the refinery practice. Pb, Ag and Au are produced. Special app. (e. g., the Miller casting machine), baghouse construction and operation, and the Cottrell system are described. The refined Pb assays 99.989% Pb, 0.002% Sb, 0.0005% Cu, a trace of Zn, 0.15 oz. Ag per ton, As and Bi nil. F. W. SMITHER.

**Copper leaching by salt-water and sulfurous gases.** C. S. VADER. *Mining Sci. Press* 117, 457-8(1918).—A  $\text{NaCl}$  soln. impregnated with  $\text{SO}_2$  becomes a powerful sol-

vent for Cu. In the past, the failure of large-scale attempts to utilize this process was due to the attempt to sat. water by merely blowing  $\text{SO}_2$  through it, to poor agitation, to the dil.  $\text{SO}_2$  soln. obtained, 1% being the max. amt. of Cu which can be held in soln. by  $\text{SO}_2$ , to the ease with which the Cu seps. from the soln. in the leaching-, press- and filter-tanks, forming throughout the mass of leached ore cuproso-cupric ppt., which is practically insol. in  $\text{H}_2\text{SO}_4$ , and to the difficulty of treating the remaining 40% of the Cu in soln. as  $\text{CuSO}_4$ , after 60% has been removed by pptn. on scrap Fe. The use of NaCl with  $\text{H}_2\text{SO}_4$  prevents the formation of cuproso-cupric sulfite. Tests made on an ore containing 1.3% Cu, and 0.016 oz. Au and 0.21 oz. Ag per ton gave, on grinding the ore to 4 mesh and treating 6 hrs. with a NaCl- $\text{SO}_2$  soln., an extn. of 66% of the Cu, 6.25% of the Au and 52.38% Ag. On grinding to 20 mesh the extn. was 88.35% Cu, 37.50% Au and 60% Ag. By grinding to 100 mesh 91.96% of the Cu, 62.5% of the Au and 61.9% of the Ag was extd. Any Fe which goes into soln. with the Cu from the ore can be recovered as follows: The  $\text{FeSO}_4$  formed is oxidized to  $\text{Fe}_2(\text{SO}_4)_3$  by applying gentle heat and blowing air through the soln. As fast as the  $\text{Fe}_2(\text{SO}_4)_3$  forms it is decomposed with formation of  $\text{Fe}_2\text{O}_3$  and  $\text{SO}_2$  which can be recovered from the soln. at almost any desired stage of the process. The Fe thus pptd. and recovered is to be used for making sponge-Fe to ppt. the Cu from the NaCl- $\text{SO}_2$  soln. E. A. TSCHUDY.

The new Merton furnace for roasting blende. ANON. *Eng. Mining J.* 106, 569-70(1918).—The furnace is of the muffled or semi-muffled type and the ore is fed in two places to two separate sets of rabbles. In its progress through the several hearths of the furnace it is confined to the set of rabbles to which it was originally fed. It is finally discharged through chutes. This arrangement results in a more uniform and complete roasting of the ore and a min. production of hearth accretions. The fuel consumption is decreased by the use of waste heat and the furnace may be readily adapted to different grades of ore by reason of the control of the air supply and hearth temp. The ore does not travel the whole length of the hearths but remains within the rabble zone of the two adjacent shafts. The hearth area of the Merton furnace is four times that of a circular furnace of similar design. The ore passes from hearth to hearth at points far removed from the gas outlets so that dusting loss is reduced to a min. The air required for the combustion of the S in the muffle hearths is preheated in the regenerator and delivered under slight pressure by means of a fan. The heated air resulting from the cooling of the roasted ore on the bottom hearth is utilized in the grate combustion chamber. E. A. TSCHUDY.

Standards for protective finishes for iron. E. P. LATER. *Foundry* 46, 424-6 (1918).—Electrochem. finishes such as Zn galvanizing, and purely physical finishes as metallic Cu, lacquers, and paints, are differentiated and their uses discussed. There is great lack of uniformity in specifications for protective plating. Proposed types of standards include weight of deposit per unit area or resistance to a standard accelerated corrosion test. Since most metallic plate is more or less porous, the latter would give a better service indication, especially on thin plate. Plate on Fe may be tested for porosity by the  $\text{H}_2\text{SO}_4$ - $\text{K}_3\text{Fe}(\text{CN})_6$ -agar reagent, which gives a blue color where the Fe is exposed. For Zn coatings, however, the method cannot be used; such plate if immersed in hot concd. NaOH gives a stream of bubbles where the Fe is exposed, Cu films up to about 0.00034 in. and Ni up to 0.00102 in. contain pinholes. Brass coatings of 0.00128 in. were free from them. Double coatings of Zn and then Cu were no more resistant than a Cu or brass coating of the same thickness. S. L. CHISHOLM.

Deformation of steel castings. T. BROWN. *Foundry* 46, 411-3(1918).—The deformation of steel castings may be caused by contraction during the cooling of the metal from the molten condition or by expansion during annealing operations. Methods of overcoming such defects are discussed. E. E. RICHARDSON.

Calculation of extraction in continuous agitation (HAM, COE) 18. Evaluation of zinc dust (WILSON) 7. Potash as a by-product (GRASTY) 18. Recovery of potash from iron blast furnaces (BRADLEY) 18. Washing coal, ores, etc. (Brit. pat. 119,038) 18.

**Concentrating ores.** W. A. SCOTT. Brit. 118,627, Aug. 14, 1918. A method of carrying out a froth-flotation process consists in introducing into the ore pulp a mixt. of a vaporized mineral-frothing agent and air, and thereby forming a froth of the concentrates at the surface of the liquid. A suitable app. is specified. Cf. 20,419, 1903, 7,803, 1905, 2,359, 1909, and 21,857, 1910 (C. A. 6, 1426).

**Treatment of copper ores.** W. H. HYATT and E. N. FELLOWES. Brit. 116,181, July 6, 1917. Cu is extd. from Cu ores by treatment with a soln. of niter cake in an excess of  $H_2O$ , metallic Cu being obtained from the soln. thus formed by any usual method, or this soln. may be neutralized with a suitable carbonate to produce an insecticide. According to the provisional specification, metallic Cu may be treated with niter cake soln. and then a suitable carbonate added in order to prep. an insecticide. Cf. 21,424, 1901.

**Concentrating ore by flotation.** T. A. JANNEY and C. M. NOKES. U. S. 1,281,018, Oct. 8. In concg. ores such as slimes of Utah Cu ore, the ground ore is mixed with  $H_2O$ , a soln. of gilsonite in kerosene or fuel oil is added, followed by the addition of pine oil or other oil having greater frothing properties than the first-mentioned oil, and the mixt. is aerated.

**Metallurgical furnaces.** J. GAUNT, D. BROOKFIELD and TYLOR & SONS. Brit. 118,750, Nov. 24, 1917. A preheating charger for crucible and like smelting furnaces comprizes a casing with a refractory lining or hopper the base of which is formed with a curved deflecting surface terminating in a depending lip, with or without slotted passages therein, whereby the products of combustion from the interior of the furnace are led or conducted through the charge in the hopper.

**Recovering zinc from siliceous calcine.** F. LAIST. U. S. 1,281,031, Oct. 8. Siliceous Zn-bearing calcine is leached with an acid soln., the soln. is neutralized to ppt. silica in the presence of the insol. residue, the Zn-bearing soln. is then sepd. from insol. substances, the residue is dehydrated at a temp. of  $150^\circ$  and leached with 8%  $H_2SO_4$  soln., and the soln. thus obtained containing additional Zn is used for the first leaching step, in treating additional portions of the calcine.

**Recovering zinc from siliceous calcine.** F. LAIST. U. S. 1,281,032, Oct. 8. The calcine is leached with acid soln. and the soln. neutralized and sepd. as in the preceding pat., after which the residue is repulped with  $H_2O$ , forming a second dil. Zn-bearing soln. Zn is separately recovered electrolytically, from the 2 solns., using insol. anodes.

**Refining metals and alloys.** STABILIMENTI BIAK-ING. A. POUCHAIN. Brit. 116,277, May 7, 1918. A process for eliminating O and oxides from molten metal, particularly bronze and brass, consists in placing in the mold into which the metal is to be poured a substance which will absorb or combine with the O present. The substance may be a quantity of one or more of the metals of the alloy in powdered form enclosed in an envelope of an easily fusible metal such as Pb.

**Precipitating metal values from cyanide solutions.** T. B. CROWE. U. S. 1,281,249, Oct. 8. Cyanide solns. containing gases such as air which might interfere with the pptn. of metal values are treated with  $Na_2S$  or subjected to a vacuum to remove the entrained gases and the soln. is then brought into contact with a pptg. agent, e. g., metallic Zn. Cu solns. may be subjected to a vacuum before pptn. with Fe.



**Coating articles with metals.** F. A. VAUGHN. U. S. 1,281,108, Oct. 8. Articles to be coated with metals are given a priming coating of Na silicate to close the pores of the article and cover corrosion, rust or foreign matter on the surface, molten coating metal is then sprayed on to the surface and, if the metal coating thus applied is sufficiently porous, the article is then treated with  $\text{CO}_2$  to produce insol. compds. from the Na silicate.

**Reinforced lead sheet.** C. M. WALES and C. BASKERVILLE. U. S. 1,280,908, Oct. 8. Sheets of Pb reinforced with Fe or steel wire or wire gauze are formed by first dipping the reinforcing wires into an alloy such as Sb 10-13 and Pb 90-87% and then embedding the coated wires in Pb or a Pb alloy which forms the principal part of the sheet. The reinforced sheets thus formed are suitable for making gaskets or tank linings.

**Alloys.** F. MILLIKEN. Brit. 118,825, May 17, 1918. See U. S. 1,277,989 (C. A. 12, 2312).

**Aluminium alloy.** L. S. GARDNER. U. S. 1,280,706, Oct. 8. An alloy which has good tensile strength, can readily be bent without breaking and which may be easily machined to a smooth surface, which retains its original brightness indefinitely, is formed of Al 78, Cu 4, Sn 10, Zn 8, Mn 0.05 and Fe 0.07 parts.

**Aluminium alloys.** GEN. ELEC. CO. Brit. 118,947, Nov. 20, 1917. Al alloys contain about 6-12% Zn, about 0.5-2.5% Mg, and about 1-3% Fe, Cr, Co, Ni, Ti, or Mn, or a mixt. of these metals, the balance being Al. The Al is preferably melted first, then the Fe, etc., added, then the Zn, and finally the Mg, and the first stages of the working of the alloy are carried out at about 450°.

**Permanent magnets; alloys.** SUMITOMO CHUKOSKO, LTD. Brit. 118,601, June 26, 1918. Steel alloys for the manuf. of permanent magnets contain about 20-60% of Co (preferably about 35%). Other metals such as 0.5-20% of W, 0.2-15% of Mo, 0.3-10% of Cr, or V or like metal may be added. The % of C may be 0.3-2%. The forged article is hardened at about 900-1000° and is then magnetized.

**Permanent magnets; alloys.** SUMITOMO CHUKOSHO, LTD. Brit. 118,602, July 2, 1918. A steel alloy for the manuf. of permanent magnets contains about 20-60% of Co (preferably about 35%), 0.3-10% of Cr, and the remainder steel contg. about 0.3-2% of C. The forged article is hardened at about 900-1000° and is then magnetized.

**Metal castings.** L. LORENTOWICZ. Brit. 116,203, Sept. 26, 1917. Undesirable holes in castings are closed by cleaning, filling with powdered metal, and then heating to melt the powder. The opening is cleaned with a reamer driven by a flexible shaft, then by acid and a flux such as Zn, HCl, and  $\text{NH}_4\text{Cl}$ . The powdered metal such as Sn, Ag, Ni, Cu, or Sn alloyed with 2% of either or all of the other 3 metals, is inserted. The powder is then melted by an arc or concd. flame and pressed and rubbed by means of heavy "irons" made of Cu or Ni, preferably heated, and finally the surplus is scraped off and the surface finished correctly.

**Solder.** A. P. BEVAN. U. S. 1,281,126, Oct. 8. A solder suitable for use on uncleaned or imperfect surfaces is produced by heating to redness a mixt. of ordinary solder and a Cu alloy (composed, e. g., of Cu and Zn and fusible at a temp. higher than the solder), stirring the mixt. and then cooling it quickly to crystallize the Cu alloy in a state of fine subdivision.

**Soldering flux.** A. H. VAN MARTER. U. S. 1,280,905, Oct. 8. A flux suitable for use in soldering Al is formed of stearic acid 16, borax 2, rosif 2 and pulverized cinnamon bark 5 parts. The flux is preferably used with a solder composed of Sn 16 and Zn 5 parts.

**Coating metals.** E. E. BURNETT. Brit. 118,182, Oct. 4, 1917. Metals, particularly Fe and steel, are provided with a coating of Cr by treatment in a hot soln. of Cr or a Cr compd. such as chromite in  $H_2PO_4$ , the proportions being preferably such as to give an excess of acid in the soln.

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## 10. ORGANIC CHEMISTRY.

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CHAS. A. ROULLER.

Constituents of resins (ZINKE, LIEB) 26. Transformation of tetrahydronaphthalene in the animal body (SCHROETER, THOMAS) 11H. Pregl's microanalytical estimation of methyl groups attached to nitrogen (EDLBACHER) 11B. Use of enzyme reagents. II. Detection of pyrimidone and differentiation of the naphthols (PALET) 7.

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**Oxalates from formates.** L. W. ANDREWS. U. S. 1,280,622, Oct. 8. In the manuf. of oxalates by heating the corresponding formates, *e. g.*, in making Na oxalate from Na formate, a small amt. of  $Na_3PO_4$  or other polybasic phosphate of an alkali metal is used as a catalyst. Complete reaction takes place at a temp. of about  $380^\circ$ .

**Oxalates from formates.** L. W. ANDREWS. U. S. 1,281,117, Oct. 8. In making oxalates from formates, *e. g.*, in making Na oxalate from the formate, the latter is heated with  $Na_3AsO_4$  or  $Na_3AsO_3$  or other alkali metal salt of an oxy acid of As which serves as a catalyst. U. S. 1,281,118 relates to the same method, except that the catalyst used is  $Na_3AlO_3$ ,  $K_3AlO_3$  or other Al compd. A temp. of about  $380^\circ$  is employed.

**Acetic acid.** S. UTHEIM. Brit. 116,279, May 13, 1918. In the manuf. of HOAc by treating AcH with O under pressure, the AcH is supplied to a confined reaction space sep. from the O and in limited quantities as required, in order to avoid explosions. Details of construction and operation of a suitable app. are specified. Cf. C. A. 12, 2573.

**Benzoic acid.** WESTON CHEMICAL CO. and J. SAVAGE. Brit. 116,348, June 7, 1917. Benzoic acid is prepd. by chlorinating boiling toluene so as to produce benzyl chloride, benzal chloride, or mixts. thereof, then heating these first with a soln. of an alkali or alk. earth, and then oxidizing by means of a hypochlorite; the resulting soln. of a benzoate is treated with an acid to ppt. benzoic acid.

**Sulfonic acid.** H. BULL. Brit. 118,727, Oct. 23, 1917. Aromatic hydrocarbons are sulfonated by continuously passing an excess of the hydrocarbon through  $H_2SO_4$ , the resulting soln. of the sulfonic acid in the excess of hydrocarbon being continuously removed. Preferably, the hydrocarbon and the  $H_2SO_4$  are continuously brought into contact on the counter-current principle. A suitable construction is specified.

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## 11. BIOLOGICAL CHEMISTRY.

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HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

**Formation of esters of phosphoric acid during alcoholic fermentation.** A. LEBEDEV. *Biochem. J.* 12, 87-92(1918).—A fermenting soln. of yeast, sucrose and phosphate, when treated with alc., gives a mixt. of esters of phosphoric acid. From the latter an osazone,  $C_{28}H_{57}O_7N_8P$  (m.  $142-144^\circ$ ), can be isolated. A *p*-bromophenylosazone (m.  $141-142^\circ$ ) and a Ba salt are also described.

B. HARROW.

**The action of ethyl alcohol and acetone upon lipase.** G. KITA AND M. OSUMI. *J. Tokyo Chem. Soc.* 39, 13-22(1918).—Activity tests of the lipase in absorbent castor beans were carried out with soy bean oil in dil. acetone and EtOH solns. at room temp. In acetone soln., the enzyme retained its activity but not in EtOH soln. S. K.

**The influence of lipoids on the rate of reaction.** M. SIEGFRIED. *Biochem. Z.* 86, 98-109(1918); *J. Chem. Soc.*, 114, II, 223.—Lecithin inhibits the transformation of yellow  $\text{HgI}_2$  into the red variety, and also the reduction of  $\text{NH}_4\text{OH} \cdot \text{AgNO}_3$  by  $\text{PhNHNH}_2$ . The latter reaction should be carried out in the dark; in the presence of even diffuse sunlight the inhibiting action of the lipid is diminished. C. J. WEST.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

**Determination of ammonia in urine, serum, etc.** H. WIESSMANN. *Landw. Vers. Sta.* 91, 347-52(1918); *J. Soc. Chem. Ind.* 37, 532A.—Ten cc. of sample plus 40 cc.  $\text{H}_2\text{O}$  plus 10 cc. of 10%  $\text{Na}_2\text{CO}_3$  soln. are distd. at  $50^\circ$  and 5 to 10 mm. are collected in standard  $\text{H}_2\text{SO}_4$ . The distn. takes about 45 min. Urea yields no  $\text{NH}_3$  under these conditions. L. J. GILLESPIE.

**Blood transfusion by the sodium citrate method.** S. W. SAPPINGTON. Hahnemann Medical Coll., Phila. *Hahnemannian Monthly* 53, 518-35(1918).—The conclusion is reached that the Na citrate method of blood transfusion is so simple and possesses so many advantages that it approaches the ideal method. J. S. H.

**Some simple valves for respiration apparatus.** A. D. HIRSCHFELDER AND E. D. BROWN. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 567(1918).—Directions are given for making simple valves for respiration app. G. McGUIRE.

**A simple stalagmometer.** A. D. HIRSCHFELDER. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 567(1918).—Directions are given for making a stalagmometer of any desired frequency. G. McGUIRE.

**New volumetric method for the estimation of phosphates in urines.** ARGO ANGOLANI. *Giorn. farm. chim.* 66, 251-2(1917); *J. Chem. Soc.* 114, II, 240.—Twenty-five cc. of the urine are treated with 1 cc. of 20%  $\text{HCl}$ , 1 g.  $\text{NH}_4\text{Cl}$  and 10 cc. of a citric acid and Mg soln. (a soln. of 35 g.  $\text{MgO}$  and 260 g. citric acid, the total vol. being 500 cc., which is then treated with 400 cc. of 10%  $\text{NH}_4\text{OH}$  soln. and kept for 2 hrs.). The ppt. is collected, washed with very dil.  $\text{NH}_4\text{OH}$  soln., dried at  $30-40^\circ$  and then dissolved in 50 cc. of 0.1  $N$   $\text{H}_2\text{SO}_4$  the excess of which is titrated with 0.1  $N$   $\text{NaOH}$ , using methyl orange as indicator. One cc. of 0.1  $N$  acid is equivalent to 3.55 mg.  $\text{P}_2\text{O}_5$ . H. S. PAINE.

**Microchemical method of estimating residual nitrogen.** IVAR BANG. *Biochem. Z.* 87, 259-63(1918); *J. Chem. Soc.* 114, II, 273.—The urea can be first extd. from the blood sample on filter paper by treatment with alc.- $\text{Et}_2\text{O}$  mixture for 5 hrs., and the remaining N is then extd. with phosphomolybdic acid soln. (0.05% phosphomolybdic acid + 1.5%  $\text{H}_2\text{SO}_4$ ) for 1 hr. The N in each ext. is estd. by the micro-Kjeldahl method. C. J. WEST.

**Preparation of a soluble concentrated product of the thyroid gland.** J. M. ROGOFF. Western Reserve Univ. *J. Pharmacol.* 12, 207-9(1918).—Kendall's product, obtained by alkaline hydrolysis of normal thyroid, was further hydrolyzed with dil.  $\text{HCl}$ ; the resulting soln. was filtered through a Chamberlain filter, the clear filtrate pptd. with hydrated  $\text{Al}$  silicate, and the ppt. filtered off and washed with water until free from acid. The adsorbed product was sepd. by slowly percolating through the material on the filter a dil. soln. of  $\text{NH}_4\text{OH}$  until the percolate was entirely colorless. The filtrate was heated and the  $\text{NH}_3$  removed by a current of air. The product obtained on evapn. contained

13.44 mg. of I per g. of dry substance. This had about the same activity as the original material. C. J. WEST.

**Acid production graphically registered as an indicator of the vital processes in the cultivation of bacteria.** ALBERT FISCHER. Copenhagen. *J. Exp. Med.* 28, 529-46 (1918).— $\text{CaCO}_3$  is added to the culture and the  $\text{CO}_2$  production followed by means of a small spirometer, the movements of which are recorded on a rotating cylinder. The curve obtained in this way corresponds exactly to the one found by titration. Effects of *B. coli* upon the *B. paratyphosus* curve are studied. C. J. WEST.

**The colorimetric estimation of hemoglobin as acid hematin.** LADISLAUS BERCZELLER. *Biochem. Z.* 87, 23-35 (1918); *J. Chem. Soc.* 114, II, 340.—By means of an Autenrieth colorimeter, hemoglobin can be estd. as acid hematin, when a washed suspension of corpuscles is employed. The method cannot, however, be employed for detg. the amt. of hemolysis in, for example, the Wassermann reaction, as it is interfered with both by the presence of serum and the soln. of the antigen in org. solvents. C. J. WEST.

**Experiments in differentiation of blood and muscular albumin precipitation and anaphylaxis.** C. LOPEX. *Am. J. Vet. Med.* 12, 853-7; *Exptl. Sta. Rec.* 38, 583.—To obtain pptg. serum for blood serum, the best method is that of intravenous injections of 20 cc. each of horse serum into rabbits weighing at least 3 kg. For the differentiation of albumin of the muscles, the best and most easily obtained and preserved antigen is that obtained by adding NaCl to minced meat and dialyzing the juice through parchment paper. When a greatly accentuated degree of specificity is required, as in dealing with meats denaturated by heat, L. has found anaphylaxis reactions superior to precipitins for the differentiation of albumins. C. J. WEST.

**Mycological detection of reducing substances in urine.** A. CASTELLANI AND F. E. TAYLOR. *Brit. Med. J.*, Dec., 1917, Rep. 6 pp.; *Physiol. Abstracts* 3, 263.—Not only may various sugars be used to identify bacteria but the reverse process may be carried out. Six organisms were used, all of which cause fermentation (appearance of gas) of glucose. Five of these act on levulose, four on maltose and so on. The tube is first inoculated with *Monilia bulcania*; if gas appears glucose is present; then with *M. krusei*, a positive result indicating levulose; then in turn with *M. pinoyi*, *M. metabudinensis*, *B. coli* and *B. paratyphosus*, positive results indicating in the order named maltose, galactose, pentose and lactose. If none of the organisms give rise to gas formation, the reducing substance must be creatine, uric acid, hippuric acid or other non-fermenting material. C. J. WEST.

**Detection of sugar in urine by means of an alkaline copper solution.** H. RUOSS. *Z. physiol. Chem.* 101, 193-209 (1918); *J. Chem. Soc.* 114, II, 337; cf. *C. A.* 12, 916.—A modification of the Worm-Müller test is described in which the quantity of the alk. Cu reagent to be boiled with 5 cc. of the urine depends on the density of the urine. The no. of cc. of reagent required is detd. by the formula  $83(D-1) + 0.7$ , where  $D$  is the density of the urine. If a deposit of red  $\text{Cu}_2\text{O}$  fails to form when the calcd. vol. of the reagent is mixed with 5 cc. of the urine under the prescribed conditions of temp. and diln., the urine is normal. By the addition of glycerol to the reagent, its delicacy is greatly increased, so that the presence of dextrose can be detected in even normal urines. C. J. WEST.

**Pregl's microanalytical estimation of methyl groups attached to nitrogen.** S. EDLBACHER. *Z. physiol. Chem.* 101, 278-87 (1918); *J. Chem. Soc.* 114, II, 336.—An account of the difficulties in carrying out Pregl's method, and of various improvements by means of which they have been overcome, the principal being the adoption of a quartz flask instead of a glass one, and the addition of a catalyst, gold chloride, which

so accelerates the cleavage of the alkyl groups that the whole operation can be completed in 1 distn. occupying about 30 min.

C. J. WEST.

Reactions of gold fish to certain habit-forming drugs (SHELFORD) 17.

### C. BACTERIOLOGY.

**Fermentation of glyoxylic acid.** A. LEBEDEV. *Biochem. J.* 12, 81-6(1918).—Dried yeast (Lebedev) decomposes glyoxylic acid with the production of CO<sub>2</sub> and acetaldehyde.

B. HARROW.

**Preservation of cholera stool specimens for delayed bacteriologic examination.** C. S. PANGANIBAN AND OTTO SCHÖBL. *Philippine J. Sci.* 13B, 275-80(1918).—The suspensions of cholera-infected stools in solns. of preservatives were kept at room temp. (32°) and examd. for cholera vibrios at intervals. Glycerol had no preserving action for the cholera vibrios, which survived for but 4 days in 20% and in 25% glycerol, and for but 2 days in 30% glycerol. The vibrios survived at least 5 weeks in solns. containing 0.25%, 0.5%, 1%, and 2.5% NaCl, resp., for 4 days in solns. containing 5% and 7.5% NaCl, resp., and for 3 days in solns. containing 10%, 12.5%, and 15% NaCl, resp. The vibrios survived at least 5 weeks when preserved in solns. containing 25%, 37.5%, and 50%, resp., of pure ox bile. Bile and NaCl soln. were found to give good results as preservatives of feces to be tested for the presence of the cholera vibrio. "Ox bile was found superior to NaCl soln. in those instances where the cholera vibrios were present in the feces in small numbers."

JOSEPH S. HEPBURN.

**The acid production of *Bacillus bulgaricus*.** W. M. CLARK. *Abstracts of Bacteriology* 1, 59-60(1918).—"Several cultures of *B. bulgaricus* were found to bring the hydrogen-ion concn. of various media to  $P_H$  3.8. This same value was found for the juice of silage and spontaneously fermented corn meal gruel, in both of which others have found *B. bulgaricus* to be dominant. A const. final hydrogen-ion concn. was not found so uniformly as in the studies on the colon and streptococcus groups of bacteria. This may be due to the difference in cultures or to the enormous difference in the rate of fermentation. "It was suggested that the complete suppression of other bacteria by the high acidities of the bulgaricus cultures is a phenomenon which has little to do with intestinal conditions, but that the lowering of the rate of growth of other bacteria or the rate of various bacterial processes by the ability of bulgaricus to maintain slightly higher levels of hydrogen-ion concn. may account for the effectiveness of certain strains of *B. bulgaricus*." Other bacteria might cause the same phenomenon with the utilization of the same carbohydrate diet. It is thought that the dynamic aspects of this problem, the suppression of putrefactive, pathogenic, or coliform organisms by the bulgaricus, should be studied.

GRACE MCGUIRE.

**The value of the petroleum-ether method for the isolation of *Bacillus typhosus* from feces.** LAWRENCE A. KOHN AND CHARLES KRUMWIEDE, JR. Dept. of Health, New York City. *J. Bact.* 3, 361-6(1918).—The method is considered unfavorable.

JOHN T. MYERS.

**Bacterial nutrition: further studies on the utilization of protein and non-protein nitrogen.** NATHAN BERMAN AND LEO F. RETTGER. Yale Univ. *J. Bact.* 3, 367-88 (1918).—The results obtained in the present investigation confirm those of previous expts. (C. A. 10, 3087), and further justify the assumption that bacteria require food substances which are of simple constitution and whose properties are such that they readily admit of absorption by the bacterial cell. No two brands of com. peptone are of the same compn., nor is it likely that any one product is uniform. Numerous tests have shown that the amino acid content of some products is decidedly greater than that of others, while the proportion of the albumose and complex polypeptide fraction is correspondingly less. The presence of a peptolytic enzyme in cultures of coli, typhi

and other gelatin-non-liquefying bacteria has apparently been demonstrated. This erepsin-like enzyme is, however, decidedly weak, and further differs from erepsin of the animal body in that it does not attack casein. The decompn. of biuret-giving material in com. peptone is, without doubt, limited to the substances of relatively simple constitution, or the lower polypeptides. Even the gelatin-liquefying and proteolytic bacteria are slow to make use of the proteoses and peptone in com. "peptone." Their initial development is at the expense of the simpler nitrogenous compds., and a reduction in the biuret-giving substances occurs only after a period of preliminary cultural development, this period often extending over at least a day or two. In this preparatory interval the proteolytic enzyme is formed which is necessary in the utilization of the sol. protein material. That the production of the enzyme which attacks gelatin is as a rule a slow process is well shown in the ordinary gelatin liquefaction tests. Bacteria are unable to decomp. coagulated native protein when there is no other source of available N in the test medium. There is reason to believe that purified proteose also is resistant to direct attack by bacteria. The ability of an organism to liquefy gelatin is no sure indication of its proteolytic properties. Gelatin and casein resemble proteose in their resistance to bacterial attack.

JOHN T. MYERS.

**The influence of carbohydrate on the nitrogen metabolism of bacteria.** NATHAN BERMAN AND LEO F. RETTGER. Yale Univ. *J. Bact.* 3, 389-402 (1918).—The failure of certain organisms to attack protein or other complex nitrogenous foods in a medium containing carbohydrate is due to the accumulation of products which inhibit growth. The N which is required in the cell reproduction of the bacteria in the sugar medium is supplied by relatively simple substances, as for example amino acids and purine bases, which are always present in the ordinary media containing com. peptone or meat ext., although in small amt. The information furnished by the titratable acidity figures is of little value. Reactions which would ordinarily be considered too high apparently had no inhibitive action on continued bacterial development. Culture fluids giving the same titration values may differ markedly in their H-ion concn. As was shown in the present work, a culture giving a Me-red negative test may have a titratable acidity twice as great as one that is Me-red positive. The presence of a carbohydrate in a culture medium may inhibit protein metabolism, depending on the nature of the medium and on the type of the organism. The presence of sufficient buffer in a medium encourages continued N metabolism. A utilizable carbohydrate in a medium has a true "protein sparing" effect providing the H-ion concn. is maintained within suitable limits.

JOHN T. MYERS.

**The classification of the aciduric bacteria.** ALFRED H. RAHE. Cornell Univ. *J. Bact.* 3, 407-21 (1918).

JOHN T. MYERS.

**Micro and macro methods of cultivating anaerobic organisms.** J. HOLKER. Univ. Manchester. *J. Path. Bact.* 22, 28-39 (1918).

JOHN T. MYERS.

**Biological characteristics of a liquefying paracoli bacillus found in war wounds of the breast of long standing.** GEORGES ROSENTHAL. *Compt. rend. soc. biol.* 81, 110-1 (1918).—This bacillus liquefied coagulated serum and also the coagula from aseptically collected blood and the fluid from sero-fibrinous pleurisy. It failed to liquefy egg albumin, even after prolonged action; casein was readily digested. Cleavage of the liquefied albumins of milk and blood serum reached the stage of amino acid production. Hemolytic action on citrated blood was noted at incubator temp.; hemolysins were also produced at room temp. Killed cultures also exhibited hemolytic action. Hemoglobin media (bouillon, gelose and peptone soln. to which an aq. soln. of human hemoglobin had been added) were readily clarified by the action of the bacillus; this action proceeded more rapidly at incubator than at room temp. Starch, sucrose, mannitol, maltose and lactose were not attacked; slight fermentation of levulose and

glucose occurred after several days. Urine was rendered alk. by the action of the bacillus. A 2:100 glycerol soln. was attacked after several days, but no action on a peptone soln. containing 20:100 of glycerol was noted. Abundant cultures were obtained in 1:300 peptone soln. and in a 1:100 soln. of pure gelatin; it was also possible to obtain cultures in media containing as little as 1:1000 and 1:900 of peptone and gelatin, resp. The bacillus did not produce indole. It is to be classified between the paracoli bacilli and the *Proteus* group; it resembles the latter in its liquefying action and its reducing action on urea and differs in its slight action on sugars, non-coagulation of milk, etc.

H. S. PAINE.

**Note on the production of acid by pneumococci.** GLENN E. CULLEN AND ALAN M. CHESNEY. Rockefeller Institute. *J. Exp. Med.* 28, 289-96(1918).—Actively growing pneumococci produce acid at such a rate that change in the  $p_H$  of the medium parallels change in the rate of growth. The death of the pneumococci is not followed by change in the reaction. Acidification during growth in beef infusion media proceeds until a  $p_H$  of about 7 is reached. At this point growth stops. The increase in the H-ion concn. is not the only origin of the injury to the cell that causes lag in a subsequent culture. The increase in H-ion concn. of the medium is not the sole cause of cessation of growth.

C. J. WEST.

**Optimum hydrogen-ion concentration for the growth of pneumococcus.** K. G. DERNBY AND O. T. AVERY. Rockefeller Institute. *J. Exp. Med.* 28, 345-57(1918).—The optimum H-ion concn. for the growth of the various types of pneumococcus is a  $p_H$  of about 7.8, while the limiting values are 7.0-8.3. Phosphate used in adjusting the reaction of the media retards growth if present in a concn. greater than 0.1 mol. Culture media should, therefore, have an initial reaction between a  $p_H$  of 7.8-8.0 and a total salt concn. of not exceeding 0.1 mol.

C. J. WEST.

**Bacteriology—its relations to pharmacy and allied sciences (GERSHENFELD) 17.**

## D. BOTANY.

CARL L. ALSBERG.

**Does the temperature coefficient of permeability indicate that it is chemical in nature?** W. J. V. OSTERHOUT. *Bot. Gaz.* 63, 317-20(1917).—O. challenges Stiles and Jørgensen's conclusion (*C. A.* 10, 2914) that permeability is chem. rather than phys. in nature. By his elec. cond. method O. shows the temp. coeff. of permeability to be not far above 1.33, whereas Stiles and Jørgensen claim it to be 2.18-2.22. The latter, if true, would probably indicate a chem. process, since no phys. processes are apt to be involved in this case which have a temp. coeff. as high as 2.

B. HARROW.

**Quantitative measurements of permeability.** WALTER STILES AND INGVAR JØRGENSEN. *Imp. Coll. of Science and Technology. Bot. Gaz.* 65, 526-34(1918).—Polemical. An answer to Osterhout (cf. preceding abstr.).

B. HARROW.

**Absorption of sodium and calcium by wheat seedlings.** H. S. REED. *Bot. Gaz.* 66, 374-80(1918).—Osterhout's theory of antagonism (*C. A.* 10, 2744, 3075) makes it appear that it cannot be applied to solns. of low concns. R. investigated this phase, and further analyzed the plants to det. the amt. of solute taken up. The expts. were conducted on wheat seedlings grown on disks of perforated Al buoyed by glass bulbs in such a way that the Al disk floated at the surface of the soln. Each disk was floated on about 3 l. of soln. in an agate enameled pan. The seeds were germinated in a soln. of the same compn. as that designed for the expt. None but sprouted seeds were used. One of the ratios of Na:Ca in which Osterhout found the greatest amt. of antagonism was the one most favorable for growth. Plants grown in a soln. containing 98 Na:2Ca attained the greatest dry wt. and were larger than any others in the series.

From this soln. the greatest amt. of ash constituents, and the greatest amt. of Na were absorbed.

B. HARROW.

**Transformation of inulin by autohydrolysis in the tubercles of asphodels.** E. COUVREUR. *Compt. rend. soc. biol.* 81, 40-1(1918).—The carbohydrate reserve of the tubers of *Asphodelus cerasiferus* and *A. microcarpus* consists of inulin. When the tubers were mascerated in  $H_2O$  there was obtained in the ext. a reducing sugar which, after investigation by the osazone method, proved to be maltose. This sugar was not pre-existent in the tubers (at least not during the season of the year (summer) when examn. was made), but only appeared in the ext. after a certain length of time.

H. S. PAINE.

**Growth of the rice plant.** S. SUZUKI. Agr. Expt. Station, Govt. of Formosa, *Bull.* 124, 62 pp.(1917).—The object of this study was to det. the development and compn. of the rice plant at successive stages in its growth. Young rice plants grown in a nursery were transplanted on April 1 into plots A, B and C at the rate of 44068 bundles per acre, each bundle containing five plants, and cultivated in the usual way. The complete fertilizers applied to plots A and B were the same except that the N for plot A was from soy bean cake and for plot B from  $(NH_4)_2SO_4$ . Plot C, on somewhat exhausted land, received no fertilizer. The results of this study are assembled in 57 tables. Detns. were made for particular dates in the growth of the plant, thus: April 30, May 10 and 26, June 16 when in full bloom and July 4 when fully ripe. Among the points detd. for these dates and for plants from each plot, A, B and C, are total wt. of the fresh plant; wt. of leaves, stems including sheaths, roots and grain; rate of increase of the wt. in each of these parts; wt. and percentage of water in the plant and in its several parts; wt. of dry matter; rate of increase in the amt. of dry matter in the entire plant and in its several parts; percentage of protein substance, glucose, sucrose, dextrin, starch, pentosans, crude fiber, N,  $P_2O_5$ ,  $K_2O$ ,  $Na_2O$ ,  $CaO$ ,  $MgO$ , and  $Fe_2O_3$ . The percentages of N,  $P_2O_5$ , and  $K_2O$  in the grain at the time of heading out, after flowering and at maturity were detd. in 3 samples. These constituents were also detd. in the chaff or glumes and in the cleaned rice. The rates of increase of N and  $P_2O_5$  were detd. Field and variety tests were made when suggested by the findings, and the products were studied with reference to fertilizer and climatic requirements. All the results of this study are thoroughly discussed.

L. W. RIGGS.

**The researches of Willstätter on the assimilation of carbon dioxide.** H. I. WATERMAN. Dordrecht. *Chem. Weekblad* 15, 1138-46(1918).—A critical review of the studies of Willstätter on the functions of chlorophyll in the assimilation of  $CO_2$ . Doubt is expressed as to the possibility of a complete solution of the problem.

JULIAN F. SMITH.

**Acridity of some plants due to a mechanical action.** E. D. BROWN AND D. D. ANDERSON. Univ. of Minn. *J. Pharmacol.* 12, 37-42(1918).—The degree of so-called acridity is governed by the physical character of the crystals and the character of the plant tissues in which they are embedded, those plants containing the long, very slender crystals being much more acrid than those where the crystals are shorter and thicker. In the arum after drying or boiling the crystals are broken up and the acridity is lost.

C. J. WEST.

The reactions of the soils supporting the growth of certain native orchids (WHERRY)  
15.

#### E. NUTRITION:

PHILIP B. HAWK.

NORMAL.

**The dietary deficiency of cereal foods with reference to their content in "anti-neuritic vitamine."** C. VORGTLIN, G. C. LAKE AND C. N. MYERS. *U. S. Pub. Health*



*Repts.* 33, 647-66(1918).—Extensive expts. were carried out on full-grown pigeons and chickens, to study the occurrence of the antineuritic vitamine in foods derived from wheat or corn. The observations made on birds were confirmed by expts. on dogs, hogs, and white mice. The following conclusions were reached: (1) For pigeons an exclusive diet of whole wheat or corn furnishes an adequate supply of antineuritic vitamine. (2) The antineuritic vitamine seems to reside in the peripheral layers and the germ of these seeds, whereas the endosperm is relatively poor in this substance. (3) If wheat and corn foods containing only a small percentage of the peripheral layers and germ of the seed are fed to pigeons or chickens, exclusive of other food, polyneuritic symptoms appear on an average of three weeks after the beginning of the feeding period. The birds can be relieved of their paralysis in a striking way by the subcutaneous administration of a highly concd. prepn. of antineuritic vitamine derived from "whole wheat" bread, yeast, ox liver, rice polishings or beans. (4) The addition of yeast (in amts. used by bakers) in the prepn. of bread from highly milled flour does not prevent the appearance of polyneuritis in birds fed on this food, but prolongs slightly the period of incubation. (5) The addition to highly milled flour or bread made from it, of a small amt. of antineuritic vitamine prepn., will correct this particular dietary deficiency. (6) The total P content of corn and wheat foods is a fairly satisfactory index of the amt. of antineuritic vitamine content in these foods.

G. MCGUIRE.

**Parallel determinations of amylase and dextrose-glycogen of the blood, liver and kidney after feeding.** E. E. BROWN AND C. W. GREEN. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 570(1918).—Sets of animals were fed meals consisting primarily of carbohydrates, carbohydrates and fats, carbohydrates and protein, and protein. The blood, liver, kidney, and muscle of these animals were examd. for carbohydrates by the Lewis-Benedict method and for amylase by the Meyers-Killian method. The animals were killed at intervals during the digestion and absorption of the test meal. The blood and tissue curves were obtained.

G. MCGUIRE.

**Diet experiments bearing on carbohydrate luxus-consumption and wasteful eating.** A. GULICK. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 549(1918).—The purpose of the tests was to det. whether excessive consumption of carbohydrate by a person of the characteristically lean physical type did not stimulate the organism to oxidize away a large part of the excess supply of fuel. The conclusions were: (1) Minimum food requirements were somewhat greater than would be expected from the activities. (2) Upon eating persistently more than was relished the weight was gradually raised. (3) If there is a luxus factor it is not overwhelmingly large. (4) If a luxus oxidation occurs at all, its effect is ended within 14 hours after taking food. (5) From an economic standpoint, the increased fuel expenditure found in these expts. with a high diet and moderate activities was a pure waste.

G. MCGUIRE.

**Utilization of the various saccharides in the metabolism of the central nervous system.** ELSE HIRSCHBERG. *Z. physiol. Chem.* 101, 248-54(1918); *J. Chem. Soc.* 114, I, 416-7.—Maltose and sucrose are not utilizable for the maintenance of the metabolic processes of the surviving spinal cords of frogs. Dextrose and levulose have about equal power in maintaining metabolism in the resting state, while lactose has less and galactose considerable more, probably due to the participation of the latter substance in the compn. of the nervous tissue. During excitation, the consumption of dextrose by the tissue greatly exceeds that of any other saccharide other than galactose. Dextrose is therefore the best material to supply for the rapid production of power for the use of nervous tissues.

C. J. WEST.

**Nitrogenous metabolism of the central nervous system.** ELSE HIRSCHBERG AND HANS WINTERSTEIN. *Z. physiol. Chem.* 101, 212-22(1918); *J. Chem. Soc.* 114, I,

416.—The isolated spinal cord of the frog contains in the fresh material 1.3% N and 1.25% in cords freed from the outer membranes. The N content is unaltered by preservation of the cords in air or O, but falls rapidly when immersed in oxygenated saline soln. The addition of a trace of a Ca salt to the saline soln. increases the rate of loss of N from the cord; K salts decrease it. Treatment with 4% EtOH practically arrests nitrogenous metabolism; elec. stimulation increases it nearly 4 times. The catabolic action is an oxidative one, because it fails to occur in the absence of free O.

C. J. WEST.

#### ABNORMAL.

**Digestion of the proteins of cooked meat in dogs with ligatured carotid arteries.** E. ZUNZ. *Biochem. J.* 12, 42–59(1918).—Ligature of carotids results in a meat meal remaining in the stomach for a longer time than under normal conditions. Z. considers this due to an altered blood supply to the stomach.

B. HARROW.

#### F. PHYSIOLOGY.

ANDREW HUNTER.

**Analysis of normal Filipino urine.** ISABELO CONCEPCION. *Philippine J. Sci.* 13B, 285(1918).—The 24-hr. urine of Filipinos has a small vol., and is low in: total N (3.05 to 12.63 g.), urea N (calcd. as % of total N), uric acid (av. 0.376 g.), and chlorides (av. 5.86 g. NaCl). "The  $\text{NH}_3$ , the creatinine, the undetd. N, and the ratios  $\text{N}:\text{P}_2\text{O}_5$  and  $\text{N}:\text{S}$  are in accord with the low-N values of the Filipino dietary." J. S. H.

**Physiological basis of thirst.** WALTER B. CANNON. *Harvard Univ. Proc. Roy. Soc. London* 90B, 283–301(1918).—The Croonian lecture for 1918. Thirst is due directly to a relative drying of the mucosa of the mouth and pharynx; true thirst depends upon the fact that the salivary glands, which keep the buccal and pharyngeal mucosa moist, require water for their action. "The water supply is maintained because we avoid, or abolish, by taking water or aq. fluid, the disagreeable sensations which arise and torment us with increasing torment if the salivary glands, because of a lowering of the water content of the body, lack the water they need to function, and fail therefore to pour out their watery secretion in sufficient amt. and in proper quality to keep moist the mouth and pharynx."

JOSEPH S. HEPBURN.

**Mechanism and control of fibrillation in the mammalian heart.** J. A. MACWILLIAM. *Proc. Roy. Soc. London* 90B, 302–23(1918).—The paper is mainly physiological. The control of ventricular fibrillation by means of certain compds. ( $\text{SrCl}_2$ , urethan, adrenaline, hirudin, and pilocarpine) is described.

J. S. H.

**The isolation and identification of the thyroid hormone.** The physiological action of the thyroid. E. C. KENDALL. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 540 (1918).—The iodine-containing compd. of the thyroid was isolated and identified as hydrotriiodooxyindolepropionic acid. This substance will relieve all symptoms of cretinism and myxedema to the same extent as desiccated thyroid. It seems probable that the physiological activity of the substance is due to the action between itself and the amino acid. It was found that the animal organism could utilize the substance when the carbonyl group had reacted forming a nitrogen derivative, and this reaction presumably is involved in the deaminizing action of the substance in the body. However, replacing the H of the imino group with derivs. renders the substance inert within the animal organism. This action also shows that when the imino group cannot function, the entire compd. is rendered physiologically inert.

G. MCGUIRE.

**The tension of the blood gases in the blood entering and leaving the lungs.** R. G. PEARCE AND A. NICHOLSON. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 550 (1918).—"As long as the minute vol. of the circulation and the respiration increases directly with the metabolism, the difference between the tensions of the gases in the

blood entering and leaving the lungs remains approx. const." During acute exercise, however, this equil. is disturbed and this difference increases progressively. "The progressive increase in the difference in the tension of gases entering and leaving the lungs is brought about by the hyperpnea which reduces the tension of the  $\text{CO}_2$  in the alveolar air below that normally present or expected, and to the very rapid and disproportionate increase in the tension of the  $\text{CO}_2$  in the blood entering the lungs. The methods employed for the estn. of the tension of the respiratory gases in the blood entering and leaving the lungs at various levels of metabolism afford a means of judging the heart's reaction to and capacity for acute work." G. MCGUIRE.

**The effect of water and sodium bicarbonate on the gastric secretion.** C. E. KING AND W. W. HANFORD. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 562(1918).—From expts. carried out on Pavlov dogs the following observations and conclusions were made: (1) Water excites the flow of gastric juice. (2) Water-starved dogs secrete no appetite juice when shown water. (3) The acidity of the gastric juice runs parallel with the rate of secretion until a max. is reached. This max. varies in different dogs but is near 0.5% HCl. (4) Water given with meals or during digestion results during the following hour in an increase in the amt. of juice secreted over that which would be secreted on the administration of either water or meat alone. This also holds true for 1%  $\text{NaHCO}_3$ . (5) 1%  $\text{NaHCO}_3$  excites the flow of gastric juice, being somewhat less effective than distd. water. (6) The acidity of alkali juice when alkali is introduced into the empty stomach is on an average a little lower than that of water juice, but not materially different when the alkali is given with meals or during digestion. This refers to total acidity. The combined acidity of alkali juice is a little higher than that of water juice. (7) Water and alkali juices possess about the same peptic activity, but both are much less active than meat juice. (8) No injurious effects were noted on the continued administration of 1%  $\text{NaHCO}_3$ . G. MCGUIRE.

**The effect of water on gastric secretion.** G. F. SUTHERLAND. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 563(1918).—The stimulating effect of water on the gastric secretion was studied when the water was introduced (1) into Pavlov dogs by intravenous infusion, (2) into the small intestine without the possibility of regurgitation into the stomach, (3) into man and dogs by stomach tube. A stimulating effect was observed in the above cases. Water introduced into the gastric intestinal tract has a greater stimulating effect than by intravenous infusion. There is a periodicity in the gastric secretion in starvation, periods of low activity alternating with periods of "spontaneous increased activity." In pups and kittens the gastric glands are not able to secrete free HCl until about the time of birth. In guinea pigs this power is developed earlier. G. MCGUIRE.

**Blood regeneration after simple anemia. I. Curve of regeneration influenced by dietary factors.** C. W. HOOPER AND G. H. WHIPPLE. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 573(1918).—These expts. indicated "that blood regeneration after simple anemia of a definite grade can be influenced at will by various dietary factors. The curve of blood regeneration on a meat diet is very rapid, a matter of days or weeks, while the curve on a diet rich in carbohydrates is very slow." Fe in the form of Bland's pills had no appreciable effect on the curve. **II. Curve of regeneration influenced by starvation, sugar, amino acids, and other factors.** *Ibid* 576. (1) *Starvation*: The curve of pigment vol. drops to about one-third normal after the unit bleeding. Beginning the first week of repair a slow but steady rise in the curve develops, which continues through the following weeks (3 to 4). No marked differences in blood regeneration, under these experimental conditions, were observed in normal, bile fistula, or splenectomized dogs. (2) *Sugar feeding*: "A definite amt. of cane sugar or glucose, or a mixt. of the two sugars (50 to 125 g.) was dissolved in a uniform amt.

of water and given by stomach tube." The curve shows an initial rise in the first week, similar to the starvation curve, but after that there is no gain and often a slight loss. The effects are discussed of gliadin, hemoglobin, gelatin, the monoamino and the diamino acid fractions of gelatin, and also of amino acids in general, on the regenerative curve.

G. MCGUIRE.

**Note in regard to the amount of sugar normally in the blood of cats.** E. L. SCOTT. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 578(1918).—After further expts. on over 100 cats, the author reaffirms his figures, published in 1914, of 0.069 g. of sugar per 100 g. of blood. Cf. *C. A.* 8, 2893.

G. MCGUIRE.

**Residual nitrogen of the blood.** J. FEIGL. *Arch. exp. Path. Pharm.* 83, 168–89, 190–203, 257–70, 271–98; *Physiol. Abstracts* 3, 247–8.—Elaborate statistical studies of residual N in the blood of 750 normal fasting people of ages varying from infancy to extreme old age. As age advances the residual N increases as a whole, and this is also true for its components urea, creatinine, creatine and uric acid.

C. J. WEST.

**Guinea-pig serum.** J. FREUND. *Biochem. Z.* 86, 421–5(1918); *Physiol. Abstracts* 3, 375.—Guinea-pig blood contains 5% proteins. F. calls attention to the constancy of the water content of the serum.

C. J. WEST.

**Determination of the quantity of secreting tissue in the living kidney.** C. K. WATANABE, JEAN OLIVER AND THOMAS ADDIS. Stanford Univ. Med. School. *J. Exp. Med.* 28, 359–76(1918).—Under the strain induced by the administration of urea, it is possible to demonstrate the relation between the degree of anatomical damage in the kidney and the degree of defect in the urea-excreting capacity induced by uranium. The closest function was obtained when the ratio between the urea content of the urine and of the blood was used as the measure of function.

C. J. WEST.

**The non-influence of rise in body temperature induced by drugs upon the protein quotient and the enumeration of white corpuscles.** FLORENCE MCCOY HILL. Univ. Cal. *J. Pharmacol.* 12, 1–17(1918).—Fluid ext. of ergot in doses of from 1 to 1.5 cc. per kg. body wt. administered intravenously to rabbits induced a steady rise in body temp. from 1.5 to 2.2. Higher doses proved fatal. Ca lactate in doses of from 5 to 8 cc. of a 1:20 soln. administered intravenously to rabbits caused an initial fall of from 0.4 to 0.6° in temp. accompanied in the higher doses by symptoms of Ca poisoning. This was succeeded by a strong rise of from 1.5 to 2.5° and disappearance of the symptoms of poisoning. The expts. show that the aseptic fever induced by these drugs causes no alteration in the globulin content of the blood nor does any alteration of note occur in the leucocyte count.

C. J. WEST.

**Liberation of the internal secretion of the thyroid gland into the blood.** J. M. ROGOFF. Western Reserve Univ. *J. Pharmacol.* 12, 193–206(1918).—An attempt was made to detect in the blood coming from the thyroid glands of 3 dogs, a physiologically active secretion by feeding the dried blood to tadpoles. One dog, whose thyroid glands were rich in colloid and had a good I content, yielded evidence of an active secretion in the blood collected from the glands during massage and during stimulation of the cervical sympathetic nerves. This result yields no evidence of the existence of secretory nerves to the thyroid for it is not possible to know the rate of liberation of the secretion and an increased concn. of the secretion in the thyroid blood alone can not be taken as evidence of increased liberation. Two dogs whose thyroid glands were hyperplastic and contained no detectable I yielded negative results.

C. J. WEST.

**Chemical stimulation of the intestinal glands.** Z. TOMASZEWSKI. *Pflüger's Archiv* 170, 260–312; *Physiol. Abstracts* 3, 252–3.—Expts. were carried out on dogs with gastric and duodenal fistulas. Psychic influences were excluded as far as

possible. Aq. or HCl exts. of stomach, various parts of small and large intestine, and pancreas were made and injected intravenously or subcutaneously. Very little effect was obtained by intravenous injection but after subcutaneous injection a flow of juice began in about 15 min. and lasted 1-2 hours, as much as 350 cc. of juice being collected in that time. In some cases the vagi were cut or atropine given, but the result was the same. The vol. of juice obtained was proportional to the solid content of the ext. used. Edkin's expts. were repeated but in those cases where secretion of juice was observed, T. explains it as due to squeezing out of juice as the result of muscular contractions of the stomach wall. In any case the effect of pyloric ext. was no more marked than that of an ext. of fundus. The substance responsible for the secretion is an organic compd., stable at 100°, slowly decomposed at 130°, or by the action of pepsin, but not of trypsin. It is not identical with vasodilatin, since Witte peptone does not cause the secretion. The activity of the exts. is increased by treatment with 80% alc. but is slowly destroyed by abs. alc. (EtOH or MeOH). It is not extd. by Et<sub>2</sub>O, CHCl<sub>3</sub> and is not pptd. by colloidal Fe or HgCl<sub>2</sub>, but  $\frac{3}{4}$  of the activity is lost by pptn. of the ext. with phosphotungstic acid.

C. J. WEST.

**The pseudo-crystallization process of fibrin formation.** E. HEKMA. *Nederl. tijdschr. v. geneesk.* 1918, I, 1386; *Chem. Weekblad* 15, 1108.—The physical theory of blood coagulation is upheld, namely, that it is due to transition of the fibrin from the hydrosol to the hydrogel state. This is ascribed to the formation of acid compds., as nucleoproteins, globulins and phosphatides, from the corpuscles and leucocytes as they sep. from the plasma. These withdraw alkali and H<sub>2</sub>O from the plasma till the fibrin is changed from sol to gel. This appears under the microscope as a pseudo-crystn., but under the ultramicroscope as the joining of minute particles in the direction of their length to form needle-shaped aggregates, which grow into threads.

JULIAN F. SMITH.

## G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**Studies on cholesterol.** V. The blood cholesterol in malignant disease and the effect of radium treatment on blood cholesterol. G. LUDEN. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 580(1918); cf. *C. A.* 12, 1213.—The examn. for cholesterol of 1069 samples of blood, including human, goat, gopher, and dog, taken under various conditions, led to the following conclusions: (1) The high blood cholesterol values in carcinoma are not due to cell destruction since they are lowered by radium treatment, but they are due to a disturbance of cholesterol metabolism. (2) The disturbance of cholesterol metabolism may be but evidence of a low rate of basal metabolism. (3) Radium, by lowering the blood cholesterol values, alters the chemical compn. of the blood, a fact which has not hitherto been taken into account in the study of the effects of radium treatment. (4) The administration of the thyroid hormone affects the blood cholesterol values in a manner similar to that of radium treatment and may, therefore, be expected to be equally beneficial to patients suffering from carcinoma. Further investigations are being carried out to det. the effect of thyroxin in carcinoma.

G. MCGUIRE.

**Azotemia and the Bordet-Wassermann sero-reaction.** D. SOTIRIADES. *Compt. rend. soc. biol.* 81, 276(1918).—Azotemia, when occurring coincidently with syphilis, inhibited the Bordet-Wassermann reaction. When azotemia disappeared or diminished following treatment the sero-reaction became positive; diminution or disappearance of azotemia was detd. by aid of the Ambard ureosecretory coeff. Nitrogenous substances probably inhibit the sero-reaction by means of a mechanism the nature of which is not understood.

H. S. PAINÉ.

**Monophagism, pellagra and scurvy.** G. VOLPINO. *Annali d'igiene Rome* 28, 280(1918); *J. Am. Med. Assoc.* 71, 1096.—Among the experiences reported was the finding that pellagrins responded with a pronounced local and general reaction to injections of exts. of maize. Including reports by others there were 136 positive and 11 doubtful or negative responses in 147 pellagrins, while positive responses were obtained in only 33 out of 130 non-pellagrins. V. regards these findings as testifying to sensitization of the pellagrins. The work is to be continued. L. W. RIGGS.

**Progressive muscular dystrophy.** FRANCIS H. MCCRUDDEN. Boston. *J. Am. Med. Assoc.* 70, 1216(1918); cf. *C. A.* 12, 827.—The myasthenia of this disease is due to hypoglycemia, and the hypoglycemia and fat deposition to impaired glycogenesis, the carbohydrate of the food being probably changed largely to fat instead of to glycogen. The impaired glycogenesis is due to suprarenal or other endocrine disease.

L. W. RIGGS.

**Cholesterol in joints.** M. LOEPER AND G. VERPY. *Bull. soc. med. hopitaux* 42, 496(1918); *J. Am. Med. Assoc.* 71, 1254.—Cholesterol deposits were found in the connective tissues, synovia, synovial fluid, and aorta of a patient with deforming polyarthritis who had succumbed to aortitis; also in a tumor and hygroma, resp., in two other patients with the same disease. To det. the nature of a deforming rheumatism it may be necessary to apply chem. tests to the deposits in the joints. Treatment would vary according as the tests revealed singly or combined carbophosphates, oxalates, uric acid or cholesterol.

L. W. RIGGS.

**Experimental paratyphoid B fever. Mechanism of immunity. Vaccination by the buccal route.** A. BESREDKA. *Compt. rend.* 167, 212-4(1918).—Expts. led to the following conclusions: Vaccination *per os* by means of heated cultures, after sensitization by bile, renders the animal resistant to paratyphoid infection. This acquired immunity, as well as that which the animal naturally possesses, depends upon local intestinal immunity.

L. W. RIGGS.

**Thermo-precipitin diagnosis of tuberculosis.** A. FORNERO. *Annali ostetricia e ginecologia* 19, 87(1917); *J. Am. Med. Assoc.* 71, 1256.—Civalleri first called attention to the zonal reaction of pptn. when an ext. of tuberculous sputum obtained with  $\text{CHCl}_3$  is brought into contact with anti-tuberculosis serum. F. proceeds by making an emulsion of the sputum with an equal vol. of physiologic salt soln., and after boiling and filtering, places it in contact with tuberculosis immune serum. The resulting pptn. reaction does not occur with normal or syphilitic serum. This technic renders the action more specific than without the heating. The immune serum found most striking in its effects came from an ass hyperimmunized with killed and live human tubercle bacilli. Four cc. of  $\text{CHCl}_3$  are poured on 2 cc. of sputum and kept 3 hrs. at  $37^\circ$ . The  $\text{CHCl}_3$  is then decanted and 4 cc. of the salt soln. are added to what is left in the tube, the mixt. agitated and the resulting emulsion boiled in the water bath for 2 min. It is then filtered cold. A tube 5 cm. by 6 mm. is filled half full of physiologic salt soln. containing the immune serum and a layer of the filtrate floated on with a pipet. The reaction reaches its height in 15 or 20 min. Positive results were obtained in 94% of all certain cases tested, and only in 7% of the nontuberculous. The test can be applied to urine pus or other body fluids and with much smaller amts. of fluid, keeping the proportions the same.

L. W. RIGGS.

**Colorimetric measure of the syphilitic infection.** ARTHUR VERNES. *Compt. rend.* 167, 383-5(1918).—In the presence of an appropriate colloidal suspension syphilitic serum flocculates while the same amt. of normal serum does not. This allows the detn. of the digression from stability which may be measured by the usual opacity methods, or, more conveniently by the color. If one imagines a substance which has at the same

time a dispersive (antiflocculant) and a hemolytic action, and of which the dispersive power may be utilized on condition of losing at the same time a proportional part of its hemolytic power, then in place of estg. directly the digression from stability by the degree of opacity, this can be measured indirectly from the degree of hemolysis by means of a colorimetric scale. Many substances are able to play this role, notably the serum of the hog. The technic is described in detail. Not only are the tubes with normal serum red and the tubes with syphilitic serum decolorized from a red bottom upwards, but the cells not dissolved give rise to tints intermediate between the white and red max. and constitute a series of syphilimetric indexes of the highest importance for the serodiagnosis, prognosis and treatment of syphilis.

L. W. RIGGS.

**Significance of lactic acid in stomach.** A. RODELLA. *Correspondenz-Blatt für Schweizer Aerzte* 48, 1210(1918); *J. Am. Med. Assoc.* 71, 1445.—R.'s studies demonstrated that sterile substances covered with pure concd. HCl, if they are not destroyed, remain sterile. But infected albuminous substances, in solid form and in not too small fragments, covered with HCl, not only fail to become sterile but undergo at body temp. strong fermentation. The products of fermentation may include lactic acid. This responds to the Uffelmann test even in the presence of HCl. Neither the lack of HCl nor the presence of a tumor and resulting stagnation are absolutely necessary for the production of lactic acid. It can occur wherever there is retention of stomach content, plus the presence of substances which bind the HCl or which protect the fermentable matter against the action of HCl. When these conditions are realized lactic acid may be formed abundantly in the stomach even without cancer. These conclusions are supported by Prou's findings of lactic acid in the fasting stomachs of 81 out of 300 cases of nonmalignant stomach disease.

L. W. RIGGS.

**Urinary siderosis.** Hemosiderin granules in the urine as an aid in the diagnosis of pernicious anemia, hemochromatosis and other diseases causing siderosis in the kidney. PEYRON ROUS. Rockefeller Inst. *J. Exp. Med.* 28, 645-58(1918).

C. J. WEST.

**Urobilin elimination in the normal and anemic dog.** HARRY DUBIN. Univ. Penn. *J. Exp. Med.* 28, 313-8(1918).—The output of urobilin is increased in exptl. trypanosome anemia presumably as the result of increased blood destruction. The administration of salvarsan during the anemic period, if it checks the blood destruction, reduces the urobilin elimination, but this result does not follow unless the blood picture improves. Splenectomy during the period of anemia does not cause a decrease in urobilin elimination.

C. J. WEST.

**Nitrogen metabolism and acidosis after the transplantation of a ureter into the duodenum.** K. GORO. *J. Exp. Med.* 27, 449-58(1918).—After transplantation of the right ureter into the intestine, or after ligation of the right ureter in dogs, an increased output of N in the urine is noted. In the former cases, there was N retention but no disturbance of the CO<sub>2</sub> content of the blood. The significance of this is probably an increased tissue catabolism. Removal of the left kidney subsequent to the above operative procedure resulted in renal insufficiency with N retention and acidosis, which terminated fatally, accompanied by the characteristic symptoms. These results demonstrate that the transplantation of the right ureter into the duodenum had so interfered with the function of the right kidney as to render it inadequate for maintaining renal function after removal of the left.

C. J. WEST.

**Paradoxical reflex secretion in chronic atropine poisoning.** The histological changes in the pancreas as a result of chronic poisoning in animals. H. ARIMA. *Arch. Exp. Path. Pharm.* 1918, 1-116, 157-67; *Physiol. Abstracts* 3, 275.—Reflex secretion of abundant saliva occurs in cats and dogs after repeated injections of atropine and

continues for weeks and months if the injections are continued for that time. It passes off in 10-24 hours after the final injection. The chorda tympani and sympathetic nerves are usually excitable, but in some cases the former was not even at the height of paradoxical secretion. The drug is believed not to act on the gland directly, but indirectly through the saliva center in the bulb, the excitability of which is raised. The gland cells manifest the usual signs of increased activity. In new born kittens of atropinized mother the same occurs. Atropine has no effect on the development of the salivary glands. No opportunity has yet occurred of testing the question on the pancreas in a fistula dog but histological evidence is adduced that this organ, like the salivary gland, is highly active in chronic atropine poisoning. C. J. WEST.

**Antibody production after partial adrenalectomy in guinea pigs.** F. L. GATES. Rockefeller Inst. *J. Exp. Med.* 27, 725-38; *Physiol. Abstracts* 3, 330.—Seven-eighths of the adrenal tissue was removed without causing any symptoms of adrenal insufficiency. No effect upon the production of antibody was observed following this operative procedure and hence it is concluded that the adrenal glands are not one of the important sources of typhoid agglutinins or of hemagglutinins or hemolysins and that they play no essential part in the mechanism whereby these antibodies are produced and maintained in the body. C. J. WEST.

**Experimental chemical pneumonia.** MARTHA WOLLSTEIN AND S. J. MELTZER. Rockefeller Inst. *J. Exp. Med.* 28, 547-50(1918).—Concns. of chloramine-T, more dilute than those which are well borne by the nasopharyngeal mucosa, are injurious to the pulmonary tissue when introduced into the bronchi in large volume. The lesions are of the nature of an extensive bronchopneumonia. These lesions differ from infectious pulmonary inflammation only in their sterility. C. J. WEST.

**Effect of intrabronchial insufflation of solutions of some inorganic salts.** MARTHA WOLLSTEIN AND S. J. MELTZER. Rockefeller Inst. *J. Exp. Med.* 28, 551-8(1918).—Intrabronchial injections of isotonic as well as hypertonic solns. of NaCl or even of distd. H<sub>2</sub>O cause no pulmonary lesions. HgCl<sub>2</sub> (1-10,000) causes marked pulmonary lesions consisting of congestion, formation of thrombi and hemorrhage. Mg salts apparently tend to cause moderate pulmonary lesions, especially true of MgSO<sub>4</sub>. C. J. WEST.

**Specific poison in the liver extracts of rabbits inoculated with typhoid and prodigiosus bacilli intravenously.** JULIA T. PARKER. Columbia Univ. *J. Exp. Med.* 28, 571-83(1918).—The livers of rabbits inoculated with cultures of *Bacillus typhosus* or *Bacillus prodigiosus* under certain conditions contain a toxic substance extractable with salt soln. When injected intravenously into normal rabbits, they develop symptoms resembling those of anaphylactic shock and succumb. The lethal dose is far smaller than that of normal liver ext. The livers of rabbits injected with typhoid antigen also yielded a toxic ext. Boiling as well as filtration through a Berkefeld filter only partially detoxicates the ext. Tolerance to 1 or 2 lethal doses may be induced by cautious immunization. Rabbits actively immunized to *Bacillus typhosus* or *B. prodigiosus* usually resist 1 lethal dose of the homologous liver poison and animals tolerant to the typhoid liver poison resist 1 minimum lethal dose at least of *B. typhosus*. Typhoid immune serum is not detoxicating either *in vivo* or *in vitro* for the typhoid liver poison. The liver poisons are specific. C. J. WEST.

**The stability of the acid base equilibrium of the blood in naturally nephropathic animals and the effect on renal function of changes in their equilibrium.** I. A study of the acid base equilibrium of the blood in naturally nephropathic animals and of the functional capacity of the kidney in such animals following an anesthetic. WILLIAM DEB. MACNIDER. Univ. N. Car. *J. Exp. Med.* 28, 501-16(1918).—The naturally



acquired chronic glomerulonephropathics of the dog are not due to an acid intoxication. Such an injury renders the acid base equilibrium of the animal unstable and susceptible to an agent such as an anesthetic which tends to reduce an acid intoxication. When naturally nephropathic animals are anesthetized with Grehan's anesthetic, the principal ingredient of which is  $\text{CHCl}_3$ , the animal develops an acid intoxication and becomes anuric and non-responsive to diuretic substances. D. A study of the efficiency of an alkali to protect the naturally nephropathic kidney against the toxic effect of an anesthetic. *Ibid* 517-28.—A 0.9% soln. of  $\text{NaCl}$  when given intravenously to anesthetized animals is not effective in preventing the development of an acid intoxication and the associated kidney injury. A soln. of  $\text{Na}_2\text{CO}_3$ , equimol. with a 0.9% salt soln., confers a variable degree of protection to the kidney. This degree is associated with the ability of the soln. to maintain a normal acid base equilibrium of the blood of the anesthetized animal. C. J. WEST.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

The chemotherapeutics of antimony. M. TSUZUKI. *Schweiz. Chem.-Ztg.* 2, 17-22, 36-40(1918); *J. Soc. Chem. Ind.* 37, 282A.—The chemotherapeutics of Sb are compared with those of As. Quinquevalent Sb compds. are inert as compared with the trivalent derivs., just as in the case of As. Sb compds. differ from As in that no immunity to Sb compds. due to acclimatization is acquired either by the blood parasites or by the animal organism. The toxicological properties of Sb and As are very similar. The therapeutic properties of corresponding derivatives of Sb and As show no parallelism either in character or degree. Many Sb compds. show pronounced selective activity in regard to trypanosomes and spirochetes, being more active toward the former. The As compds. do not have this characteristic. Observations regarding the influence of the constitution of the org. portion of the mol. on the therapeutic or toxic properties of As compds. are not valid for the corresponding Sb compds. These differences in the relation between constitution and activity of similar compds. may be due to the greater ease with which Sb is split off from its org. derivatives. For the same reason it is more difficult to suppress the poisonous properties of Sb by org. combination. Certain combinations of As and Sb derivs. have shown useful results.

G. MCGUIRE.

The effects of injecting acacia. W. J. MEEK AND H. S. GASSER. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 548(1918).—From a series of expts. on animals the following conclusions were reached. "Injections of large amts. of 20% acacia have practically no effect on blood pressure other than the mechanical one of increasing the blood vol. The heart rate is not influenced other than that due to the slightly raised blood pressure. After hemorrhage acacia seems to maintain blood pressure better than salt solns. Respiration is unaffected. The urinary secretion after acacia can be stimulated by sodium nitrate apparently as well as normally. An animal under ether may have acacia injected until the blood in a 10% soln. with no symptoms of disturbance. Intact animals have had their blood made up to 4% acacia with no unfavorable symptoms. Acacia leaves the blood stream in the early stages at the rate not exceeding 10% per hour. The rate soon slows and fairly large amts. of acacia may be found in the blood 2 days later. A pentose reaction may be obtained from the urine an hour after the injection of acacia."

G. MCGUIRE.

Restorative effects of salts of magnesium and calcium after lethal doses of sodium oxalate. FREDERICK L. GATES. *J. Exp. Med.* 28, 305-12(1918); cf. *C. A.* 12, 186.

C. J. WEST.

Pharmacological and therapeutic study of benzyl alcohol as a local anesthetic. DAVID I. MACHT. Johns Hopkins Univ. *J. Pharmacol.* 12, 263-79(1918).—Benzyl

alc. possesses powerful local anesthetic properties and a very low toxicity as compared with other well-known local anesthetics. Its use has been demonstrated in practical surgery. The minimum lethal dose is about the following: mice, 1 cc. per kg.; rats, 1 to 3 cc.; guinea pigs, 1 to 2.5 cc.; cats, 1 cc. per kg. C. J. WEST.

The toxicity of the venom of the Mexican (Durango) scorpion as compared with that of the Chinese scorpion. SEIKO KUBOTA. Johns Hopkins Univ. *J. Pharmacol.* 12, 447-89(1918).—The amt. of extractive substance contained in the poisonous glands of different species of scorpion and that of the alc.-insol. toxic matter of the ext. appears to differ in different species. Mexican sting contains more than the Chinese. The active principle of the ext. seems to be of protein nature, is sol. in saline soln. and less sol. in pure water, but is insol. in abs. alc. or ether. The active principle of the Mexican extract is affected very little by drying for a long time, but when preserved at room temp. exposed to sunlight it undergoes putrefaction and loses its convulsant character. It is not affected by heating to 100° for a short period but is destroyed after 30 min. Prolonged action of alc. does not destroy the principle, but acids and alkalis destroy it, alkalis acting more destructively. The active principle of the Chinese ext. when muscular twitching is taken as the indicator, is more resistant to treatment by chem. and physical means. The minimum fatal dose of the venom for mice is about 0.015 mg. per g. body wt. in case of the Mexican scorpion and 1.5 mg. in the Chinese one. For frogs the values are 0.01 to 0.05 in the former and 0.3 to 1.0 in the latter. The symptoms produced by the two seem to differ in certain points. Death in mice and guinea pigs seems mainly to be due to suffocation which may be considered to be caused by the convulsion and paralysis of the respiratory app. and in frogs to a central and peripheral paralysis. The ext. raises blood pressure, acting upon the motor app. of the heart. It increases the tonus and rhythmic movements of smooth muscles. It has a hemolytic action upon both nucleated and non-nucleated blood corpuscles.

C. J. WEST.

Tonus waves from the sino-audicular muscle preparation of the terrapin as affected by adrenaline. CHARLES M. GRUBER AND CASPAR MARKEL. Univ. of Colo. *J. Pharmacol.* 12, 43-51(1918).—Adrenaline in diln. of 1:150,000 to 1:174,000,000 causes a disappearance of the tonus waves observed in the sino-audicular muscle prep. of the terrapin. It causes simultaneously an increase in the force and amplitude of contraction. After the injection of strong solns. a longer time is necessary for the reappearance of the tonus waves than with dil. solns. O in either case hastens the reappearance of the oscillations. This may be merely a matter of hastening the oxidation of the adrenaline.

C. J. WEST.

Tonus waves in the terrapin auricles as affected by pilocarpine, atropine and adrenaline. CHARLES M. GRUBER AND CASPAR MARKEL. Univ. of Colo. *J. Pharmacol.* 12, 53-7(1918).—Pilocarpine-HCl has a marked effect upon the contractions of the heart, almost completely stopping them, but has no effect on the tonus waves. Atropine sulfate increases the general tonus of the heart when injected into the soln. in which the muscle is contracting, either in the normal solution or following the administration of pilocarpine. Adrenaline or its hydrochloride causes a disappearance of the tonus waves in the atropinized heart as it does in the normal heart.

C. J. WEST.

Detoxifying action of sodium salt on potassium salt in the guinea pig. SAMUEL AMBERG AND HENRY F. HELMHOLZ. O. S. A. Sprague Memorial Inst. *J. Pharmacol.* 12, 19-34(1918).—Guinea pigs survive the intravenous injection of otherwise fatal doses of KCl and  $K_2SO_4$  if these are administered in mixts. of NaCl. The same effect is noted when  $Na_2SO_4$  is added to the KCl soln. The effect is, however, not quite so marked. An equal concn. of AcONa does not afford any protection against the KCl

intoxication. The protection offered by NaCl against  $\text{NH}_4\text{Cl}$  is somewhat doubtful; at any rate it is much less marked than that against KCl. The presence of 50% glucose in the KCl soln. protects the animals very markedly. A usual fatal dose of KCl or  $\text{K}_2\text{SO}_4$  injected soon after an injection of 5% NaCl is tolerated, while a previous injection of 0.55% of NaCl protects not at all or only very rarely. Where a previous injection of  $\text{Na}_2\text{SO}_4$  is tolerated it may also protect against KCl. The previous injection of NaCl seems to protect against  $\text{NH}_4\text{Cl}$ . The intravenous injection of 10% NaCl soln. in proper dosage produces a clouding of the crystalline lens. This cloudiness appears within about 20 min. and disappears in the course of about 4 hours.

C. J. WEST.

**Transformation of tetrahydronaphthalene (tetralin) in the animal body.** G. SCHROETER AND K. THOMAS. *Z. physiol. Chem.* 101, 262-75 (1918); *J. Chem. Soc.* 114, I, 418.—Tetrahydronaphthalene fed to a dog is absorbed and eventually excreted in combination with urea. The existence of 4 compds. of tetrahydronaphthalene and urea is theoretically possible, and the authors have succeeded in prepg. all of them by the interaction of KCNO on the respective amines in  $\text{H}_2\text{O}$ . *ar-Tetrahydro- $\alpha$ -carbamidonaphthalene*,  $\text{C}_{10}\text{H}_{14}\text{ON}_2$ , crystallizes in square plates from alc., soften at  $198^\circ$  and melts at about  $206^\circ$  (quickly heated, at  $212^\circ$ ). *ar-Tetrahydro- $\beta$ -carbamidonaphthalene*, needles, m.  $134^\circ$  (decompn.). *ac-Tetrahydro- $\alpha$ -carbamidonaphthalene*, needles, m.  $210.5^\circ$ . *ac-Tetrahydro- $\beta$ -carbamidonaphthalene*, needles, m.  $183^\circ$ . Comparison of the natural product with these compds. shows that tetralin in its passage through the body is converted into *dl-ac-tetrahydro- $\alpha$ -carbamidonaphthalene*. In the prepn. of the *ar- $\beta$* -compds., a small amt. of a substance was obtained in the form of needles, which did not melt below  $245^\circ$  and possessed the compn. of *di-ar-tetrahydro- $\beta$ -naphthylcarbamide*,  $(\text{C}_{10}\text{H}_{12}\text{N})_2\text{CO}$ .

C. J. WEST.

**Treatment of amebic dysentery with Chaparro amargosa (Castela Nicholsonii of the family Simarubaceae).** ANDREW WATSON SELLARDS AND MONROE ANDERSON McIVER. Harvard School of Trop. Med., and Mass. Gen. Hospital. *J. Pharmacol.* 11, 331-56 (1918).—Several members of the family Simarubaceae contain bitter substances. These have been examd. chemically and several substances giving color reactions have been obtained but as yet have not been identified. The evidence points to the presence of a glucoside. In the treatment of 4 cases of amebic infection with the product, the immediate results were distinctly significant.

C. J. WEST.

**Differences in the action of drugs on different parts of the bowel.** WALTER C. ALVAREZ. Univ. Cal. Med. School. *J. Pharmacol.* 12, 171-91 (1918); cf. *C. A.* 12, 2384.—Results are given of tests of 76 substances. A list of convenient dosages is appended.

C. J. WEST.

**Anthelmintics: their efficiency as tested on earthworms.** TORALD SOLLMANN. Western Reserve Univ. *J. Pharmacol.* 12, 129-70 (1918).—All clinical anthelmintics are markedly toxic to earthworms. This simple test may therefore be used for detg. whether a given substance has any anthelmintic properties, and also to det. the relative activity of different samples of a given drug. It could not be used to compare the clinical value of different anthelmintics, since this often involves factors other than simple vermucidal efficiency, such as absorption, local and general toxicity, etc. *Aspidium*, *chenopodium*, *pelletierine*, *thymol*,  $\beta$ -*naphthol*, and  $\text{CHCl}_3$  are highly effective. So is *santonin* in the presence of an appropriate solvent (bile salts and  $\text{NaHCO}_3$ ). Somewhat less effective, but still quite toxic are *kamala*, *kousso* and *granatum*. *Spigelia* is rather feeble. Fresh (germinable) pumpkin and squash seeds are highly efficient, the active principle being sol. in water and destroyed by boiling. In view of their cheapness, availability and presumably low toxicity to men, renewed clinical interest in these is indicated. Spices and "sharp" substances, including

mustard, pepper, onion and cantharidine, are toxic. Their use in the preparatory treatment is therefore well justified (except of course cantharidine). Indeed, pepper potentiates or synergizes the effects of the more active anthelmintics. Mixtures of the active anthelmintics give simple summation of efficiency. This may be useful for decreasing their toxic effects on the hosts. Oleoresin of *aspidium* appears to be stable, although the dry rhizome deteriorates. Different samples agree fairly well in activity. Different samples of pelletierine tannate are also of fairly uniform activity. The pelletierine tanret is a secret prepn. without any advantages. Most substances that are toxic to earthworms produce a primary irritation or agitation that results in the withdrawal of the worm from the neighborhood of the poison. By virtue of this effect, anthelmintics doubtless often expel the parasite when the concn. does not rise sufficiently high to kill the worm.

C. J. WEST.

**Primary depression and secondary rise in blood pressure caused by epinephrine.** HUGH MCGUIGAN AND EMRY G. HYATT. Univ. of Ill. *J. Pharmacol.* 12, 59-69(1918).—In most dogs, especially mature animals in good health, the intravenous administration of adequate doses of epinephrine (0.5 to 1 cc. of 1:10,000), after a quick rise in the blood pressure, is followed by a rapid fall and a secondary rise. The secondary rise is apparently due to a central action of the epinephrine acting through the sympathetic ganglions. The basis for this belief is that the removal of the head or pithing of the brain prevents the occurrence of the phenomenon. Also, paralysis of the ganglia with nicotine prevents it. It occurs after the sectioning of the vagi and the administration of atropine or pilocarpine. The vagus apparently is not involved in the mechanism. Artificial intracranial pressure during the administration of epinephrine will cause similar changes in the blood pressure.

C. J. WEST.

**The relation between the chemical structure of the opium alkaloids and their physiological action on smooth muscle with a pharmacological and therapeutic study of some benzyl esters. I. The relation of the chemical structure of the opium alkaloids to their action on smooth muscle.** DAVID I. MACHT. Johns Hopkins Univ. *J. Pharmacol.* 11, 389-417(1918).—In respect to their action on all kinds of smooth muscle, the opium alkaloids can be divided into 2 classes: the pyridine-phenanthrene group, of which morphine is the principal member, and the benzyl-isoquinoline group, of which papaverine is the principal member. Morphine and its related alkaloids tend to increase the contractions and raise the tonus of smooth muscle, while papaverine and its related alkaloids have the reverse effect. The stimulating or pressor effect of morphine seems to reside in the pyridine or piperidine portion of its molecule, while the inhibitory or depressor effect of papaverine seems to reside in the benzyl portion of its mol. **II. A pharmacological and therapeutic study of some benzyl esters.** *Ibid* 419-46.—A pharmacological study of benzyl benzoate and benzyl acetate shows that these esters produce the same effects on smooth muscle tissue as the opium alkaloid papaverine. These esters are easily metabolized by the body and are comparatively non-toxic. The low toxicity and the papaverine-like action has led to their clinical employment in conditions of excessive peristalsis or spasm of smooth muscle viscera, with successful results. The minimum lethal dose of benzyl benzoate for dogs after intravenous injections in the form of emulsion is about 1.5 cc. per kg. By subcutaneous injection in cats, the dose is from 1 to 1.5 cc. per kg. In rabbits 1 cc. can be injected subcutaneously with impunity. For rabbits the dose is about 2 cc. In guinea pigs the dose is about 1 cc. The toxicity of the acetate is slightly higher, due to its quicker absorption.

C. J. WEST.

**Studies on the biochemistry and chemotherapy of tuberculosis. XVI. The pharmacology and toxicology of copper salts of amino acids.** HARRY L. HUBER. Univ. Chicago. *J. Pharmacol.* 11, 303-29(1918).—Cu, whether in the form of the sulfate, leucinate,

glycinate or glutamate, shows no variations in action when introduced into the conjunctiva of rabbits. The lower dilns., 1%, produce hyperemia and lachrymation to the same degree, while the higher dilns. are inactive. It also shows very little, if any, variation in ability to produce acute intoxication when introduced in dil. soln., subcutaneously. The diln. is important as the local injury produced by higher concns. interferes with absorption. The toxic subcutaneous dose was found to be between 4 and 6 mg. per kg. for guinea pigs. When introduced intracutaneously, the lower dilns. cause necrosis and induration and the higher dilns. cause little or no change. The histological change with the same diln. is the same for all salts. The salts likewise show no variation in action when introduced in small gradually increasing doses, 0.5 to 1 mg. Cu per kg., for a long period of time, 105 days, either subcutaneously or intramuscularly. This dosage of Cu seems to produce no gross or microscopic changes in the organs examd. All the salts mentioned above have the same ability to dialyze through celloidinf sacs when either water or horse serum is used both inside and outside the sac. The rate of dialysis is somewhat faster with distd. water than with horse serum. No variation was noted when the salts were introduced by feeding in small gradually increasing doses to 10 mg. per kg. per day for 72 days. The results were very similar to those obtained from subcutaneous or intramuscular administration. Thus the work seems to show that the 3 Cu amino acid salts examd. produce exactly the same physiol. effects as a simple inorg. salt,  $\text{CuSO}_4$ . XVII. Distribution of gold in animal tissues. LYDIA M. DEWITT, SIDNEY M. CALDWELL AND GLADYS LEAVELL. O. S. A. Sprague Memorial Inst. and Univ. of Chicago. *Ibid* 357-77.—Gold differs somewhat from other metals in its distribution in the animal body. It seems to select the spleen by preference since the amt. per g. wt. or the gold concn. in the spleen is in most cases much greater than in the liver. Either the kidney or the liver may come 2nd in gold concn. About 0.5 of the gold administered has been recovered from the urine and feces within 7 days after a single injection and in 2 months during which weekly injections were given; more is excreted through the urine than through the feces, at least in the earlier part of the treatment. Gold salts are readily absorbed after subcutaneous injection. They are quickly taken up from the blood after intercardiac injection and usually no more than a trace of gold is found in the circulating blood 24 hours after the injection. Two to 4 hours after the last injection no gold was found in the clear serum but a considerable amt. was recovered from the blood cells. No gold was found in the brain. The amt. of gold administered, the duration of treatment and the time since the last dose seem to exert no const. or consistent influence on either the total or proportional gold content of the animal organs. C. J. WEST.

The effect of intravenous injections of some sodium salts with special reference to the supposed toxicity of sodium phosphate. ISIDOR GREENWALD. Roosevelt Hospital, N. Y. *J. Pharmacol.* 11, 281-301 (1918).—The symptoms observed after intravenous injection of neutral solns. of Na salts ( $\text{NaCl}$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{HPO}_4$ ) depend upon the changes in the volume of circulating fluid, changes in osmotic pressure, changes in reaction, due to selective retention of the cation, disturbances of the relation between Na and K, Ca and possibly other ions in the blood and other tissues, the nature of the anion, but probably only through the effect in detg. the permeability of the cells to the Na. There is no evidence of a direct toxic action of the  $\text{PO}_4$  ion. C. J. WEST.

Poisoning with methyl alcohol. J. POHL. *Arch. exp. Path. Pharm.* 83, 204-20; *Physiol. Abstracts* 3, 275.—Although MeOH produces cerebral effects, no organ contains so little of the alc. as the brain. It is more sol. in  $\text{H}_2\text{O}$  than in fats, and the lipid solubilities are stated not to be of any moment. A variety of medicaments, among which Ringer soln., charcoal and yeast (subcutaneously), NaI, adrenaline and alkalies

figure, are recommended for detoxication and it is claimed that such a treatment rests on a rational basis.

C. J. WEST.

**Effect of lactic acid on the respiratory center.** SEYMORE J. COHEN. Univ. Ill. *J. Pharmacol.* 11, 221-8(1918).—Lactic acid, when injected intravenously in moderate doses, about 0.5 cc. *N* acid per kg. body wt., produces marked increase in respiratory rhythm, both in rate and amplitude. This is not specific but may be produced by practically any acid. The mechanism of this hyperpnea probably involves 3 factors. The acid may liberate  $\text{CO}_2$  from the blood carbonates and the excess  $\text{CO}_2$  may play some part in the excessive movement; the acid may act as a direct respiratory stimulant; probably most important, the acid sensitizes the respiratory center.

C. J. WEST.

**An experimental study of the venom of the Manchurian scorpion.** SEIKO KUBOTA. Japanese Medical School, Mukden. *J. Pharmacol.* 11, 379-88(1918).—An ext. of the dried, expressed juice of the venom glands of the scorpion injected into a frog produces the same symptoms as those following a bite by the living animal (primary spasm and twitching of the muscles and increased reflex excitability, followed by paralysis). These are of peripheral origin due to the direct action of the poison on the motor nerve endings; when the excized muscle is immersed in the toxic ext. the motor nerve endings lose their excitability. The concd. exts. of the venom glands produce an irritation of sensory nerve endings. The toxic ext. has no definite action on the nerve trunks or on striated muscle itself. The minimum fatal dose for frogs varied from 0.05 to 0.1 mg. per g. wt.

C. J. WEST.

**Cutaneous irritation by mustard oil as influenced by various solvents.** T. SOLL-MANN. Western Reserve Univ. *J. Pharmacol.* 11, 229-30(1918).—Olive oil and other good solvents for mustard oil hinder its penetration into the skin. The greatest irritation is obtained by aq. suspensions, for instance, in mucilage.

C. J. WEST.

**The physical-chemical theory of narcosis.** J. VESZI. *Archiv ges. Physiol.* 170, 312-36; *Physiol. Abstracts* 3, 269.—The exptl. part consists in the demonstration that bacteria which are obligative anaerobes can be narcotized and then lose their motility. It is therefore clear that narcosis is not essentially due to a depression of oxidative changes alone. The remainder of the paper is theoretical. The velocity of reaction, or of the phases of a progressive reaction, depends on the surface tension at the interphase surfaces and narcosis depends on a reversible lowering of this surface tension. A quant. expression (of which the Meyer and Overton theory is the qual. expression) can be deduced from the adsorption formula and the Henry Dalton law, and is applicable to a variety of conditions.

C. J. WEST.

**Antiseptic power of Vincent's boro-hypochlorite mixture.** BAZIN. *Compt. rend. soc. biol.* 81, 122-4(1918).—The antiseptic power of Vincent's boro-hypochlorite mixt. was compared with that of  $\text{CHI}_3$  and tincture of I. A sample of soil containing 9-11 millions of bacteria per g. was used for inoculating the media employed; this soil contained *B. coli*, *B. proteus vulgaris*, *B. subtilis*, a bacillus of the *B. perfringens* group and, in addition, many unidentified species. Pathogenic species were present, as was shown by the rapidly ensuing death of guinea pigs with antiseptically produced muscular wounds in which small amts. of the soil had been introduced; the septic vibrio was subsequently isolated from the wounds. The following min. amts. of antiseptics were required in order to prevent bacterial development in bouillon containing 10 cc. of soil per l.:  $\text{CHI}_3$  25 g., tincture of I 10 g., Vincent mixt. 3 g. The following min. amts. per l. of bouillon were required in order to destroy within 24 hrs. the bacteria present in 1 g. of soil: tincture of I 20 g., Vincent mixt. 8 g.;  $\text{CHI}_3$ , even in large amt., failed to produce complete sterilization. The relative toxicity of these antiseptics, when introduced into the peritoneal cavity of guinea pigs, was next

studied. Painting of the cavity with tincture of I caused an intense reaction and death;  $\text{CHI}_3$  in large amt. had the same effect. The Vincent mixt., even in large amt., caused only a mild reaction without death. The action of tincture of I was practically the same as that of the Vincent mixt. in the case of cutaneous and superficial wounds infected with the soil; the utility of  $\text{CHI}_3$  was distinctly less. Vincent's mixt. was greatly superior to the other antiseptics in the case of muscular wounds; it was very well tolerated, while tincture of I was strongly caustic for muscular tissue. Vincent mixt. was much superior to tincture of I in the case of osseous wounds.

H. S. PAINE.

**Internal secretions and enzymes, their inter-relation and inter-dependence, their value and application in modern therapy.** JOHN J. McNULTY. *J. Am. Inst. Homeopathy* 11, 531-40 (1918).—A review, with special stress on the therapeutic value of polyglandular therapy.

JOSEPH S. HEPBURN.

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## 12. FOODS.

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W. D. BIGELOW AND F. F. FITZGERALD.

Use of saccharin as a sugar substitute (HENSEL) 17.

**Food preparations.** H. H. SENIOR. *Brit.* 118,874, Aug. 28, 1917. Whey from cheese-making is heated to about  $190^{\circ}\text{F}$ . to ppt. coagulable constituents, which are sep'd. by settling and draining and are dried and powdered. Cf. 25,127, 1909.

**Bread and biscuits; food preparations.** R. GRAHAM. *Brit.* 116,272, May 1, 1918. Bread, biscuits, rusks, crackers, breakfast food prepn's., and the like, in which all the ingredients of the grain are used and rendered assimilable, are prepd. from any whole grain, etc., by (1st) malting some grain, (2nd) treating the bran and middlings of another quantity and quality of grain with the malted grain, (3d) mixing the latter product with the flour from which the bran, etc., was sep'd. and which has been acted upon by yeast, and (4th) baking. In carrying out this process, soft wheat, that is grain high in starch but low in gluten constituents, is malted. This may be done by any usual process, but is preferably performed by steeping at about  $60-70^{\circ}\text{F}$ . and then slowly germinating till the acrospire is about two-thirds of the length of the grain. This process takes from 10 to 17 days. The malted grain is then treated in a kiln with dry air heated to about  $160-190^{\circ}\text{F}$ , and is then stored in air-tight bins, etc., for from 6 weeks to 3 mos. to mellow or ripen, after which it is ground. The main supply of grain, which should be a strong kind, high in gluten constituents, is milled, and the middlings and bran therefrom are combined and mixed with a quantity of the malted product and with  $\text{H}_2\text{O}$  to form a soft paste. The mixt. is then heated to about  $100-150^{\circ}\text{F}$ . for from 12 to 36 hrs. with occasional stirring. The product obtained, after drying for about 12 hrs. at  $130-150^{\circ}\text{F}$ ., may be used as a finished breakfast food product. The superior white, spring clear, and low grade milling fractions of the flour from which the bran, etc., have been removed, are now acted upon, preferably sep., by yeast at about  $81^{\circ}\text{F}$ ., to form sponges, and the sponges obtained are mixed together and with the soft paste, previously obtained, salt and  $\text{H}_2\text{O}$  to form a dough. When ripe, the dough is cut up, proved and baked in a slow oven at about  $330^{\circ}\text{F}$ ., decreasing to about  $290^{\circ}\text{F}$ . for from 3.5 to 4 hr. to form the desired bread. The invention is stated to be applicable to treating all kinds of cereals, beans, peas, potatoes, cassava, turnips, carrots, etc.

**Egg preparations.** E. S. SPENCER and F. F. KEMP. *Brit.* 119,007, Apr. 17, 1918. Whole eggs and the yolks of eggs sep'd. from the whites are dried to powder and mixed in the proportion of 3 parts by wt. of the whole eggs to 2 parts of the yolks.

The resulting compd. is stated to contain 42.6% protein, 49% fat, 3.4% ash, and 5% H<sub>2</sub>O. For use, the powder is mixed with H<sub>2</sub>O in the proportion of 65 parts H<sub>2</sub>O to 35 of powder.

**Butter substitutes.** J. J. A. TALBOT. Brit. 118,215, Dec. 13, 1917. A process for prepg. a butter substitute on a domestic scale consists in utilizing waste fats, and meat or bones having adherent fatty matter, such material being chopped up, slowly melted or simmered down at a temp. of about 42°, clarified by the addition of salt, and strained. The clarified fat is poured into a mixing receptacle, milk and a binding or saponifying agent such as white of egg or dried blood, together with coloring matter if desired, are added, and the mixt. is churned until it assumes a pasty condition of the consistence of butter. A suitable app. is specified.

**Evaporated vegetable products.** PACIFIC EVAPORATOR CO. Brit. 118,466, Sept. 5, 1917. In the evapn. of food products of a vegetable nature, and particularly potatoes, the sliced potatoes or the like, placed on trays, are subjected to a steaming process, dry steam being employed. The steaming is continued only for a very short time, so that no breaking down of the cells occurs. The steamed potatoes are then dried in an evaporator kept below 156° F., atm. humid air being employed to obtain a uniform drying. Previous to steaming, the unsliced potatoes may be subjected for a short time to a 3% soln. of NaCl and the sliced potatoes to a similar soln., to prevent discoloration.

**Milling wheat.** J. S. REMINGTON. Brit. 118,431, July 28, 1917. Wheat is treated, preparatory to milling, by washing with a soln. of Na or K carbonate. The soln. is removed from the grain in a whizzer and the grain is dried by treatment with cold, preferably artificially cooled, air. The small amt. of carbonate retained by the grain affects the gluten, and improves the baking qualities of the flour obtained from the grain

**Soy-bean milk.** W. J. MELHUISE. Brit. 118,535, Dec. 10, 1917. In prepg. artificial milk from soy bean as described in 24,572, 1913 (C. A. 9, 1205), the beans are soaked in H<sub>2</sub>O before being ground. The residue, after treatment to obtain an albuminous ext. and sepn. in a filter press, is submitted to high pressure for about 2 days to sep. oil and to obtain a meal not too rich in oil, which may be used as a food for cattle, poultry, etc., or as an addition to flour for bread-making, or mixed with bread crumbs, flavored with honey, meat ext., etc., and baked to form a breakfast food. The albuminous ext. is prepd. by mixing the meal and H<sub>2</sub>O in a steam-jacketed pan fitted with cone-shaped cup stirrers open at both ends. The same pan, exhausted of air, is used subsequently to mix the ext. with sugar and fat, sesame or arachid oil being used to prep. milk for ordinary purposes, and coconut oil to prep. a milk for margarine making. The emulsified mixt. is treated with a culture and pasteurized. Acids such as butyric or citric acid, or substances such as CaO, MgO, or NaHCO<sub>3</sub>, may be added. The oil contained in the albuminous ext. is sepd. by centrifugal action and the slime obtained may be used as a soap base. Cf. 30,275, 1910 (C. A. 6, 1646), 9,626, 1915 (C. A. 11, 78), and 13,903, 1915 (C. A. 11, 506).

**Apparatus for sterilizing milk.** F. H. ROGERS. U. S. 1,280,851, Oct. 8.

#### 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**Chemical control of water softeners.** L. F. CLARK. *Chem. Met. Eng.* 19, 674-7 (1918).—A discussion of the reactions involved in the lime-sod aprocess, and the derivation of a practical and simple field routine analysis. The methods outlined are designed for application by untrained men, and have the advantages and disadvantages incident to such conditions.

M. C. PERRY.



**Mobile chlorine water-purification plant.** R. K. TOMLIN, JR. *Chem. Met. Eng.* 19, 678-80(1918); see C. A. 12, 2639. M. C. PERRY.

**Slow sand and multiple filtration.** WALTER CLEMENCE. *Engineer; Eng. Contr.* 50, 123(1918).—Multiple filtration ending with slow sand filters is suggested as a possible substitute for present practice. L. P.

**Chlorination of Chicago's water supply.** J. ERICSON. *Am. J. Pub. Health* 8, 772-5(1918).—The bacteriol. tests made on untreated water during 1916 showed *B. coli* present in 1 cc. in 18 samples out of 1000 examd.; during the first 9 months of 1917 the treated water showed *B. coli* present in less than 1 per 1000. During the first 9 months following the complete chlorination of Chicago's water supply the death-rate from typhoid fever was reduced 71.44%. There is, therefore, a strong indication that the use of Cl reduced the death-rate due to typhoid fever more than 70%.

M. C. PERRY.

**Excess lime treatment system for Aberdeen (Scotland) waterworks.** A. C. HOUSTON. *Engineer; Eng. Contr.* 50, 100(1918).—The author recommends treatment of Deon water with from 1 to 2 parts per 100,000 of CaO, storage for 7 days, artificial carbonation if required, and sand filtration. LANGDON PEARSE.

**Microbiological investigations of some Japanese water systems.** H. HATTORI. *J. Coll. Sci. Imp. Univ. Tokyo* 40, 7 pp.(1917).—A study of the action of slow sand filters in purification of surface waters. The species of bacteria and other life forms occurring in the working layer in Japanese filters together with the character of raw waters permit a higher rate of filtration without sacrifice of efficiency. M. C. P.

**Analysis and quality of water.** *Munic. J.* 45, 26-8(1918).—A tabulation of analytical data from a number of cities. L. P.

**Hypochlorites in drinking water.** A. R. LING. *Analyst* 43, 347-8(1918).—Ammonia and amino compds. are converted into chloramine and chloramino derivs. when treated with hypochlorite. The Cl in chloramines liberates I from KI; hence, to ascertain whether a water containing much org. matter has been treated with hypochlorite treat as follows: Place 50 cc. of the water and 50 cc. of distd. water in 2 cylinders and add to each 1 cc.  $N H_2SO_4 + 0.1$  g. KI. The water which has been treated with hypochlorite will liberate I giving a brown coloration; the distd. water will remain colorless. Nitrites will liberate I but these should have been oxidized by the hypochlorite. M. C. PERRY.

**Substances dissolved in rain and snow.** V. C. SHIPPEE AND L. FORDYCE. *Chem. News* 117, 322-3(1918).—Forty-one pptns. during the period from Sept. 29, 1917, to June 1, 1918, were analyzed. The total rain and snow during that period was the equiv. of 17.9 in. of rain. An attempt was made to establish a relationship between the time elapsing between 2 pptns. and the amt. of various substances found in the water; no definite conclusions were reached. Except in the early fall, the highest amts. of sulfates were obtained during the winter. Phosphates were found, but repeated tests failed to detect the presence of  $CO_2$ . M. C. PERRY.

**Development of sewage treatment.** KENNETH ALLEN. *Munic. Eng.* 55, 244-9(1918).—A review of the problem in detail, touching on recent developments in tanks, screens, activated sludge, acid recovery of grease, etc. L. P.

**Worcester (England) experiments with activated sludge process.** *Surveyor; Eng. Contr.* 50, 122-3(1918).—An existing tank 86 by 78 by 18 ft. deep was baffled into 36 bays, each 21 x 8 ft. wide, of which 20 are aeration and 8 are settling tanks. Perforated pipes are used with holes 12 in. apart, over which are placed porous tiles forming the bottom of valleys. Settling tanks have 60 deg. bottoms with 6 in. air lift. Sludge has 95% water. The aeration period is 6 hr. with flow rate of 1 mill. gal. per 24 hr.,

plus 20% sludge, settling period 1 hr. 40 min. 750,000 gal. per 24 hrs. is actually treated. Analyses are given. L. P.

**Pressure of sewage sludge.** F. A. DALLYN. *Trans. Am. Soc. Mun. Impmts.; Can. Engr.* 35, 69-70(1918).—The presence of grease may interfere with filter-pressing. Acidification, as at Bradford, Eng., and heat in press helps grease recovery. A possible use of sewage grease may be in textile soaps. The author is hopeful as to eventual recovery of fertilizer. L. P.

**Electrochemical sewage treating process at Decatur, Ill., in 1916.** W. S. SHIELDS. *Munic. Eng.* 54, 68-73(1918).—The city of 50,000 population discharged sewage with starch waste into a flashy river. An exptl. electrolytic plant of 1 mil. gal. capacity per 24 hr. was built to demonstrate a process whereby sewage mixed with CaO flows between iron electrodes to settling tanks. The estd. annual cost of the process including interest and depreciation lies between that of sprinkling filters and activated sludge. Sludge utilization was not effected. Analytical data with bacterial results are given. LANGDON PEARSE.

**Methods of sampling of sewage and other liquids.** G. B. KERSEAW. *Surveyor; Eng. Contr.* 50, 111.—Detailed directions for making 24-hr. composite, proportional to flow, from hourly samples. L. P.

**Camp sanitation.** C. B. HARTFREE. *Surveyor; Eng. Contr.* 50, 134.—Suggestions are given for equipment for ablutions and for water purification. The employment of canvas reservoirs, of colored flags to designate the use of water, the use of 6 gr.  $\text{Al}_2(\text{SO}_4)_3$  per gal. and sedimentation for clarification, spent tea leaves for color removal, and  $\text{KMnO}_4$  for oxidation are recommended. L. P.

**Suggested modifications of the standard method for the study of the dust content of the air.** H. F. SMYTH. *Am. J. Public Health* 8, 769-71(1918).—The standard method calls for 5 classes, based on the area of the dust particles as compared with the standard unit, or the smallest ruled square in the Sedgwick-Rafter eye-piece: (1) 0.04 sq. mm., (2) 0.01, (3) 0.0004, (4) 0.00014 sq. mm., (5) particles too small to count (presence indicated by plus sign). S. suggests that the 2 larger classes be eliminated and that class 5 be divided into 1 or 2 divisions. He used the following classes: 0.04, 0.01, 0.004, and 0.001 mm., and suggests that 0.04, 0.004, 0.01 and 0.001 mm. be used in the future. He also suggests the reporting of solids per 100 ft. rather than per m. l. and the detn. of the mineral and org. content of the air. M. C. PERRY.

**Softening water.** E. EDSEY and S. TUCKER, and MINERALS SEPARATION, LTD. *Brit.* 118,668, Sept. 3, 1917. Ca and Mg salts or other metallic impurities are pptd. by ordinary reagents, the ppt. being formed into a froth with the aid of a suitable frothing agent, such as oleic acid, soap, eucalyptus oil, or turpentine, and removed by flotation, the process being analogous to the processes of ore treatment described in 7,803, 1905, 2,359, 1909, 21,857, 1910 (*C. A.* 6, 1426) and 105,627.  $\text{Na}_2\text{PO}_4$  or a mixt. of  $\text{Na}_2\text{HPO}_4$  and NaOH is preferred as precipitant for Ca and Mg salts, but other known precipitants may be used. Sol. salts of Cu or Zn may be pptd. with CaO or NaOH and the ppt. may be formed into a froth with the aid of turpentine.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

**The reactions of the soils supporting the growth of certain native orchids.** EDGAR T. WHERRY. *J. Wash. Acad. Sci.* 8, 589-98(1918).—The majority of the native orchids grow in peats which are acid in reaction, but some are reported to occur in

limestone regions, where the soils are likely to be alk. Examn. of certain of these occurrences showed that the soils in these regions may be acid also, the calcareous rock being buried beneath vegetable matter or sandstone drift. It seems evident that conclusions as to the requirement of alk. or acid conditions by a given species can be depended upon only when based on actual investigation of the soils in which they grow. A method for measuring acidity in the field has therefore been worked out, based on the effect of varying H-ion concn. on different indicators. The soil is shaken up with water and allowed to settle, the effect of turbidity being overcome by viewing the pure indicator solution through a layer of soil extract, while comparing it with an equal volume of indicator solution to which soil extract has been added. The indicators used, starting with the most acid, are: bromophenol blue, methyl red, bromocresol purple, phenol red and phenolphthalein. About 200 soil samples collected as close to the roots of the plants as possible were examd. It was found that a few species do actually grow in the waters of calcareous swamps where the alkalinity is about 10, according to the scale proposed: the neutral point is made 1, and acidity or alkalinity described by direct numerical intensities instead of exponents, as is usually done. Other species grow on hummocks of moss in the same swamps, where the acidity is found to increase upward, often reaching an acidity of 300 ( $P_H = 4.5$ ) at the top. Still others grow in woods, in weakly acid soils, the upper limit for many of them being acidity 100 ( $P_H = 5.0$ ), for an additional number 300 ( $P_H = 4.5$ ). Finally in peat overlying clay around the margins of swamps the acidity was found to reach, for one species, the high value of 3000 ( $P_H = 3.5$ ). The reaction appears to be more important than moisture content in detg. where a given species will grow.

E. T. W.

**Recent investigations of soil aeration. I. With special reference to agriculture.**

ALBERT HOWARD. *Agr. J. India* 13, 416-29(1918).—A lecture in which the relation of soil aeration to productivity is discussed. The soils permitting a free exchange of air produce best crops. The harmfulness of excessive irrigation is said to be due to the prevention of soil aeration. **II. With special reference to forestry.** R. S. HOLE. *Ibid* 430-40.—Where soil ventilation was interfered with in pot expts. Sal seedlings grew and developed poorly. The seedlings grew more rapidly in well-aerated soils than in those receiving no aeration. This is attributed to a lack of O and an excess of  $CO_2$ . The water expts. show that when the concn. of gas reaches roughly 500 mg. per liter the root tips and rootlets of Sal seedlings are blackened and killed and the production of new roots is inhibited.

J. J. SKINNER.

**Chemical analysis of soils from the Concepción plantation (Cruz Alta, Argentina).**

IVAN R. FONTANA. *Univ. Tucumán inform. depart. investig. industr.* 1917, 27-33.—F. reports an analysis of a siliceous, slightly calcareous soil with no humus and a siliceous, very slightly calcareous subsoil without humus. He discusses the legitimate function of the soil analyst in his relation to agriculture and the conclusions and practical value of these conclusions which may be deduced from an analysis. In the present instance comparison of the analyses of soil and subsoil gave a negative answer to the question whether the land should be cultivated more deeply.

H. S. PAINE.

**A method for the counting of certain protozoa in the soil.** ARAO ITANO AND GEORGE B. RAY. *Soil Science* 5, 303-10(1918).—Direct microscopic counts are made conveniently with the aid of the vital stain phenolsulfonaphthalein of the organisms in films of the soil suspension thickened with gelatin. Probable error calcs. were made.

L. J. GILLESPIE.

**Cultivation of alkali soils in the northern provinces (of Argentina).** ENRIQUE F. SCHULTZ. *Univ. Tucumán inform. depart. investig. industr.* 1917, 45-51.—Salts of alkali metals caused more damage to crops at the end than at the beginning of the growing season, this being due to gradual accumulation of these salts at the surface

of the soil owing to capillary ascension of their aq. solns. and evapn. of the same. The harmful effect of these salts is physiological rather than purely chem.; the crust of salts formed around the stems and trunks of the plants has great affinity for  $H_2O$  and injures the plants by a process of plasmolysis. The custom of growing rice on these soils for a no. of yrs. is effective, on account of the frequent application of  $H_2O$ , in leaching out a great proportion of the alk. salts but leaves the land in bad physical condition and tends to prevent free access of O to the soil. S. makes the following suggestions for cultivating alk. soils: (1) growing of crops which show greater resistance to alk. salts; (2) installations of an adequate system of drainage; (3) moderate irrigation in combination with rational cultivation; (4) retention of moisture in the soil (thus reducing the capillary ascension of alk. salts in soln.) by means of frequent cultivation and also by using a secondary growth of certain plants (preferably legumes) to protect the terrain from excessive effects of sun and wind; (5) by applying humus (green manures, etc.) so as to reduce evapn. of moisture; (6) application of gypsum to soil which contains  $Na_2CO_3$ , thus causing gradual productions of  $Na_2SO_4$  and  $CaCO_3$ ; (7) in clearing a virgin terrain plants which have become more or less habituated to alk. salts should be removed to another locality before being burned, in order that the salts present in the ash may not be again introduced into the soil.

H. S. PAINE.

**The influence of aeration upon the yields on bog soils.** BR. TACKER. *Mitt. des Vereins zur Förderung der Moorkultur im Deutschem. Reiche* 35, 2(1917); *Biedermanns Zentr.* 47, 95(1918).—It was found "that under the exptl. conditions chosen no distinctly favorable influence of increased aeration appeared."

ALBERT R. MERZ.

**Contribution to the agricultural study of iron.** A. MONNIER AND L. KUCZYNSKI. *Arch. sci. phys. nat.* 43, 66-8(1918).—In order to throw some light upon the different results obtained by previous investigators in studying the effect of iron when applied to soils, M. and K. planned lab. expts. to det. the soly. of Fe present in the soil and to det. the changes which ferrous and ferric compds. undergo in contact with arable soil. A fallow soil containing 3.2% Fe and 6% Ca yielded small amts. of Fe when treated with dil. org. acids, though only traces to distd.  $H_2O$  and dil. soln. of alkali carbonates and bicarbonates. Certain siliceous soils, completely exhausted of Ca, containing an appreciable amt. of  $H_2O$ -sol. Fe, when planted with rose-colored hydrangea, yield a blue flower, but when  $CaCO_3$  or  $MgCO_3$  is added no additional amt. of  $H_2O$ -sol. Fe is obtained and a flower of normal color results. 0.001 N soln. of  $FeCl_2$  filtered through a layer of soil 20 cm. thick showed no Fe in the filtrate but large amts. of Ca and Cl; the upper layer of the soil retained the Fe, and assumed a dark brown color. The line of demarkation was very plain and it was noted that the thickness of the colored portion was greater for the soils poorer in Ca.  $FeSO_4$  reacted the same as  $FeCl_2$ . M. and K. conclude from these results that the Fe normally present in soils is insol. This explains the increase in yield from the addition of small amts. of Fe. Such favorable action does not result unless the fertilizer is placed within reach of the roots, as otherwise the surface layer removes it by rendering it insol. In attempting to substitute  $K_4Fe(CN)_6$  as a source of Fe, it was noted that the compd. was not rendered insol. but underwent a double decompn., only part of the K remaining in the soil, and the filtrate contained the balance of the salt as  $K_2Fe(CN)_6$ . According to M. and K. this reaction is due to adsorption, as the same phenomenon is observed in filtering the soln. through a layer of fine sand. Plot expts. with  $K_4Fe(CN)_6$  did not yield good results since even very dil. solns. were toxic.

R. B. DEEMER.

**Some experiments with U-cultures.** VOGEL. *Leipzig. Deutsch. landw. Presse* 44, 522(1917); *Biedermanns Zentr.* 47, 90-3(1918).—Pot and field expts. were conducted with oats. Either the soil or the seed was inoculated with "Universal" cultures, which were claimed to render N available to non-legumes by fixation of atm. N and by rendering

the N compds. of the soil sol. "Nitragin-Compost" ("a compost prepd. in a special way and containing much humus, fecal substances, lime salts, some N,  $P_2O_5$ , etc., and intensively permeated with quite a large quantity of U-cultures prepd. in concd. form for the purpose"), the N content of which was 0.402%, was simultaneously tested. Contrary to the observations published by A. Kühn (*Deutsch. landw. Presse* 44, 467-8 (1917)) only 8% of the tests showed any benefit by the inoculations. Fertilization with N without inoculation caused considerable increase of yield in the pot expts. but only a relatively small one in the field expt. ALBERT R. MERZ.

Some experiments with U-cultures. A. KÜHN. Berlin-Grunewald. *Deutsch. landw. Presse* 44, 529-30 (1917); *Biedermanns Zentr.* 47, 93-5 (1918).—A criticism of the work of Vogel (preceding abstract). ALBERT R. MERZ.

Manures in relation to vines. H. E. LAFFER. *Agr. Gaz. N. S. Wales* 29, Pt. 7, 491-6 (1918).—A general discussion of benefits to be derived from the use of nitrogenous fertilizers (both from green manures and mineral nitrates),  $K_2SO_4$  and KCl, phosphates, lime and gypsum on Australian soils in connection with vineyards. R. B. DEEMER.

Top-dressing lucerne with superphosphate. ANON. *Agr. Gaz. N. S. Wales* 29, Pt. 7, 468-9 (1918).—Applications of 200 lbs. per acre of phosphate give large returns on heavy, black soils of basaltic origin. Results indicate that no advantage is gained by the use of  $K_2SO_4$ . R. B. DEEMER.

Conversion of insoluble phosphate. A. M. JOHNSTON. *J. Chem. Met. Soc. S. Africa* 18, 140-1 (1917).—Saldanha Bay phosphates, analyzing 20.6%  $P_2O_5$  and 0.4% sol.  $P_2O_5$  were treated by a method almost identical with that used in producing Wolter phosphate (cf. "Fertilizers and Manure," A. D. Hall, p. 135) yielding a product containing 13.8%  $P_2O_5$  and 12.4% sol.  $P_2O_5$  in 2% citric acid. Fusion with  $CaCO_3$  alone for 1.5 hrs. at 1,100° was tried; it gave a product containing only 6.4% sol.  $P_2O_5$ . Many trials with the fluxes used in varying proportions resulted in the selection of a mixt. of 25 g. of the phosphate; 17.5 g.  $NaHSO_4$ , 11 g.  $CaCO_3$  and 1.5 g. of powdered coke to produce the product yielding the above figures. R. B. DEEMER.

Decomposition and preservation of liquid manure. F. BLANCK. *Landw. Vers. Sta.* 91, 253-69, 271-90, 309-43 (1918); *J. Soc. Chem. Ind.* 37, 522-A.—Treatment of the urine with  $H_2SO_4$  can fix, up to a certain limit, the  $NH_3$  formed when urine is added to soil. Formaldehyde preserves the urine, but interferes with plant growth and is not recommended. I. J. GILLESPIE.

Use of stable manure for improving soil. IVÁN R. FONTANA. Univ. Tucumán extens. agric., *Bull.* 14.—F. discusses, among other things, the chem. changes which occur during the fermentation of manure and means by which loss of N as  $NH_3$  may be prevented. He protests against the wasteful agricultural methods prevailing in Tucumán (Argentina) and urges the increased use and conservation of manure, silage, etc. H. S. PAINE.

Some of the principal insects affecting vegetables in Trinidad and Tobago. F. W. URICH. *Bull. Dept. Agr. Trinidad and Tobago* 17, Pt. 2, 77-87 (1918).—A description of the prepn. and use of the usual sprays and insecticides used in the treatment of such garden pests as are found in this locality. R. B. DEEMER.

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Treatment of copper ores (insecticides) (Brit. pat. 116,181) 9.

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Fertilizer containing calcium urea phosphates. C. BOSCH. U. S. 1,280,650, Oct. 8. Products for use as fertilizers, which probably contain complex calcium urea phosphates, are formed by grinding together urea and a superphosphate containing primary Ca phosphate as its chief ingredient. The mass, which at first becomes moist,

soon loses its moistness and assumes the condition of a dry powder which may readily be distributed over the soil. Gaseous  $\text{NH}_3$  may be used for treatment of the product as it assists in maintaining the dry pulverulent condition of the material during storage.  $\text{NH}_4$  carbamate also may be used. The urea may be employed in the form of nitrate if desired and the proportions of the reacting substances are so regulated that the final product will contain about 9-13% each of N and  $\text{P}_2\text{O}_5$ .

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Analytical composition and definition of vermouth wines. W. I. BARAGIOLA. *Schweis. Apoth. Ztg.* 56, 381-2 (1918); cf. *C. A.* 11, 1013.—A recent ruling by the Italian ministry (*Giorn. vinic. ital.* 44, 194-5 (1918)) defines the scope in the making of vermouth wine from various Italian white wines, especially Canelli muscat wine which produces the genuine Turin article. Addition of cane sugar and purest  $\text{EtOH}$ , as well as aromatic plant extracts and caramel, is permitted. The mixt. is allowed to age, is pasteurized at  $60^\circ$ , cooled to  $5^\circ$ , allowed to ripen, and when clear, it is bottled. Its chem. compn. varies as follows:  $\text{EtOH}$  13.5 to 17% by vol.; total acid as tartaric, 0.4 to 0.5%; volatile acid as  $\text{AcOH}$  0.04 to 0.15%; reducing substances 0.8 to 1.5%; glycerol 0.5 to 0.9%; ash 0.15 to 0.3%; alkalinity of ash 8.0 to 30.0 cc. per l. These standards permit proper classification of inferior com. vermouth wines. S. W.

Materials for making alcohol; yeast. E. C. BAYER and S. ORLAJENSEN. *Brit.* 119,030, Aug. 29, 1918. Seaweeds, including both zostera and algae, are used, after hydrolysis with acids or otherwise, for the production of alc. and yeast.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMBERY.

Peru and Tolu balsams. V. MACRI. *Boll. chim. farm.* 57, 102-3 (1918).—When a drop of an  $\text{AcOH}$  soln. of synthetic Peru balsam was added to a soln. of a drop concd.  $\text{H}_2\text{SO}_4$  in 15 cc. glacial  $\text{AcOH}$  there was produced a distinct bluish green zone which slowly turned a deep violet-red; natural Peru balsam remained unchanged. The coloration produced by synthetic Peru balsam was practically the same as that given by Tolu balsam and  $\text{PhCHO}$ . Two samples (A and B) of Tolu balsam with quite different organoleptic properties were tested by adding 1 cc. of a 2% soln. of the balsam in  $\text{AcOH}$  to 1 cc. of the above soln. of  $\text{H}_2\text{SO}_4$  in  $\text{AcOH}$ . The colors produced were: (A) brownish yellow; (B) intense brownish red. When 1 cc. of the balsam soln. was treated with 2 cc.  $\text{Ac}_2\text{O}$  and 1 drop of the  $\text{H}_2\text{SO}_4$ - $\text{AcOH}$  soln. the colors produced were: (A) pronounced blue turning to yellow, green and brown in succession; (B) intense violet-red. When 1 cc. of the balsam soln. was treated with 2 cc.  $\text{Ac}_2\text{O}$  and 1 cc. of the  $\text{H}_2\text{SO}_4$ - $\text{AcOH}$  soln. the colors produced were: (A) intense violet-red turning quickly to brownish yellow; (B) deep violet-red. No appreciable difference between the 2 samples was noted when dil.  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  were used. Sample B was bright red in color (A was somewhat yellowish) and was harder and more transparent and had a better scent than A. In detg. cinnamic aldehyde in Peru balsam according to the Italian pharmacopoeia M.'s experience indicates that it is best to add the  $\text{H}_2\text{O}$  first, then the  $\text{Et}_2\text{O}$  and finally the alk. soln.

H. S. PAINE.

Aluminum acetoborate. ANON. *Boll. chim. farm.* 57, 104 (1918).— $\text{H}_2\text{BO}$  is used in the following proportion for stabilizing  $\text{Al}(\text{AcO})_3$  solns.: 700 g.  $\text{Al}(\text{AcO})_3$ , 30 g.  $\text{H}_2\text{BO}_3$ , 1000 g.  $\text{H}_2\text{O}$ . This soln. may be used with or without diln. An emulsion

may be prepd. viz.: 3 g.  $\text{H}_2\text{BO}_3$ , 10 g.  $\text{Al}(\text{AcO})_3$ , 40 g. lime water, 50 g. liquid vaseline. These preps. are used for burns and cutaneous affections.

H. S. PAINÉ.

**Solutions of atoxyl with mercuric iodide.** LABAT. *Boll. chim. farm.* 57, 104(1918).—The following solns. are recommended for intramuscular injections: (1) 10 g. atoxyl, 0.5 g.  $\text{HgI}_2$ , 5 g.  $\text{NaI}$ , sufficient distd.  $\text{H}_2\text{O}$  to make 100 cc.; (2) 10 g. atoxyl, 0.2 g.  $\text{HgI}_2$ , 2 g.  $\text{NaI}$ , sufficient distd.  $\text{H}_2\text{O}$  to make 100 cc. The solns. are placed in yellow glass bottles and sterilized.

H. S. PAINÉ.

**Solubility of iodoform in glycerol.** P. CHIARIA. *Giorn. farm. chim.* 66, 94-6 (1917).—In view of recent use of  $\text{CHI}_3$ -glycerol preps. (e. g., 2 g.  $\text{CHI}_3$  and 20 g. glycerol for intrapleural injection in respiratory diseases and the lack of data on the soly. of  $\text{CHI}_3$  in glycerol C. has made detns. of the latter. Ninety-five % glycerol ("bidistillata purissima") of  $d_{15} 1.255$  ( $29.34^\circ \text{Bé.}$ ) and recrystd. comm.  $\text{CHI}_3$  were used. Definite wts. of glycerol and  $\text{CHI}_3$  were heated 2 hrs. under a reflux condenser; the soln. was rapidly filtered and cooled to  $15^\circ$  and a definite wt. was treated with alc.- $\text{Et}_2\text{O}$ , 10 cc. of a 0.1 N  $\text{AgNO}_3$  soln. and 1 drop of concd.  $\text{HNO}_3$  and heated 1 hr. under a reflux condenser, excess of  $\text{AgNO}_3$  being then detd. with  $\text{NH}_4\text{SCN}$ . The soly. was 0.123% at  $15^\circ$ . Soly. was not greatly increased at increased temp. nor by use of  $30.6^\circ \text{Bé.}$  or anhydrous glycerol. The prepn. mentioned above should be sterilized by heating 1 hr. at  $100^\circ$  before using.

H. S. PAINÉ.

**Determination of the strength of alcoholic camphor solutions without a polarimeter.** J. PINKHOFF. *Pharm. Weekblad* 55, 1386-7(1918).—By detg. the sp. gr. of various mixts. of  $\text{EtOH}$  and camphor, and the number of cc. of  $\text{H}_2\text{O}$  required to produce turbidity in such mixts., tables can be compiled from which the strength of a camphor soln. can be quickly found after making these simple detns. The method is illustrated with curves and a numerical table.

JULIAN F. SMITH.

**The loss of hypochlorite content in standing solutions.** I. M. KOLTHOFF. Utrecht. *Pharm. Weekblad* 55, 1318-24(1918).—Analyses were made to det. the effects of light and alkalinity on the keeping qualities of hypochlorite solns. for surgical work. In general, these solns. keep much better in the dark than in light. Moderately alk. solns. keep better than those nearly neutralized with  $\text{NaHCO}_3$  or  $\text{CO}_2$ . An excess of alkali tends to protect against the action of light. Such decompn. as occurs in alk. soln. is partly by chlorate formation and partly by the reaction:  $2\text{NaOCl} \longrightarrow 2\text{NaCl} + \text{O}_2$ . In solns. neutralized with  $\text{NaHCO}_3$  or  $\text{CO}_2$ , the loss is almost entirely from chlorate formation. A moderately alk. soln., kept 14 days in the dark, had lost 7.6% of the original  $\text{NaOCl}$  content; but no further loss occurred during 2 months of standing in the dark.

JULIAN F. SMITH.

**Structure of the seed coat of *Paullinia cupana* Kunth.** A. TSCHIRCH and FINN KOLLE. *Schweiz. Apoth. Ztg.* 56, 445-7(1918).—An illustrated botanical description.

S. WALDBOTT.

**Pyrethrum and its cultivation.** H. FÄSS. *Terre vaudoise, Schweiz. Apoth. Ztg.* 56, 429-31, 447-50(1918).—An account of the successful cultivation of pyrethrum, since 1912 in the Swiss canton of Vaud, from genuine imported seeds of *P. cinerariaefolium*. The yield from 304 sq. m. area in 1 expt. was 14.6 kg. of dried flowers, from which 92.4 kg. of a concd. soap-pyrethrum soln. was prepd. to combat the *Cochylis* worm of the vine. For this purpose, the soln. is dild. 1 in 10. A max. of 50 l. is required for spraying a vineyard area of 450 sq. m. An old formula for spraying requires 1.5 kg. pyrethrum powder and 2 kg. of black soap dissolved in 100 l. of  $\text{H}_2\text{O}$ .

S. WALDBOTT.

**Sabadilla seed.** A. TSCHIRCH. *Schweiz. Apoth. Ztg.* 56, 457-9(1918).—Anatomical study, illustrated, of the seed of *Veratrum album*, related to sabadilla seed (at present

inaccessible in fresh state) to show that raphide cells claimed to exist normally in the seed coat of the latter, are present only in immature seeds. They, as well as starch, are always absent in ripe seeds. S. WALDBOTT.

**Localization of the active glucosides in leaves of the genus digitalis.** H. BALJET. *Schweiz. Apoth. Ztg.* 56, 248-51, 262-3(1918). See C. A. 12, 1687. S. WALDBOTT.

**Colloidal medicines.** R. EDER. *Schweiz. Apoth. Ztg.* 56, 369-74, 393-8, 408-10, 417-20(1918).—An address, giving a survey of colloidal phenomena, with special application to pharmacy, in particular the modern colloidal Ag preps. and those of other metals, e. g., the Aurum potable of the alchemists. S. WALDBOTT.

**Cultivation of medicinal plants in Norway and Sweden.** ANDERSSSEN. *Norges Apoth. Tidsskrift* 1918, 169; RUSTUNG, *Ibid* 1918, 69; *Schweiz. Apoth. Ztg.* 56, 398-400 (1918).—A. gives an historical account, referring especially to Angelica root. R. reports on the recent cultivation, near Christiania, of henbane, belladonna, and stramonium, the latter especially thriving well. Alkaloidal contents in all 3 plants were higher than when growing wild. Other plants cultivated with success are valerian root, verbasicum, chamomile, peppermint and opium, the latter containing 12.44% morphine. The gradual and uniform drying of medicinal plants is important. S. WALDBOTT.

**The seeds of cinchonas cultivated in Java.** A. TSCHIRCH AND FINN KOLLE. *Schweiz. Apoth. Ztg.* 56 405-7 (1918).—Of the total 23 species cultivated in Java, the exact dimensions of the fruit and the seed wings and the description of the latter are tabulated. S. WALDBOTT.

**Examination of powdered drugs.** H. ZÖRNIG. *Schweiz. Apoth. Ztg.* 56, 201-5, 213-7, 229-36(1918).—An address, giving a survey of the procedure in microscopical examn. of powdered drugs by the systematic use of certain reagents and appliances for quant. detn. of adulterations. S. WALDBOTT.

**Table of the more important tests and properties of official fats and oils.** P. FLEISSIG. *Schweiz. Apoth. Ztg.* 56, 216-21(1918).—Tabulation of tests and properties of 14 official fats and oils. S. WALDBOTT.

**Substitute for acetum sabadillae.** P. FLEISSIG. *Schweiz. Apoth. Ztg.* 56, 251 (1918).—Dissolve veratrine 5.0 g. in 40% com. AcOH 750.0 g., add H<sub>2</sub>O to make 5 l., and tincture of burned sugar 4.0 g. S. WALDBOTT.

**Can medicinal rhubarb and licorice root be cultivated in Switzerland?** A. TSCHIRCH. *Schweiz. Apoth. Ztg.* 56, 257-61(1918).—Medicinal rhubarb, derived chiefly from the northern plant *Rheum tanguticum* Tsch. growing in High Tibet, partly also from the southern *Rh. officinale* Baillon, is a mountain plant which could be cultivated with success in Swiss mountain woods at 2000 or 3000 m. altitude. A detailed account is given, based on Tafel's report from Tibet. Licorice root, on the other hand, thrives well in any soil, provided there is abundant moisture. This condition is fulfilled in the flood plains and deltas of rivers. The northern end of Lago Maggiore at Locarno would be an ideal place for the successful cultivation of this root. S. W.

**New remedies.** ANON. *J. pharm. chim.* 18, 139-40, 177-80, 208-12(1918).—*Acetozone* is a mixt. of equal parts of AcOOBz and an inert absorbent powder. In contact with H<sub>2</sub>O, it hydrolyzes, yielding peroxides having oxidizing and germicidal properties. It is sol. in 33 parts of oil, the soln. being used in inhalations; it is also sol. in Et<sub>2</sub>O, CHCl<sub>3</sub>, CCl<sub>4</sub> and petroleum oils. It is used as an antiseptic in ophthalmology and affections of the mouth, nose and throat. *Afridol*, the "Na salt of hydroxymercuric toluic acid" is used in the form of an antiseptic soap in parasitic skin diseases. It is not easily sol. in neutral or acid solns., but is readily sol. in aq. solns. of NH<sub>4</sub>OH + NH<sub>4</sub>Cl. The presence of Hg may be shown by boiling with HCl. *Apinol* is obtained by dry distn. of the wood of *Pinus palustris* or *P. australis*, and frac-



tionating, collecting and purifying the fraction 182.2° to 193.3°. The resulting amber-colored oil has d. 0.946 and b. 182.2° approx.; hence is chiefly *l*-menthone,  $C_{10}H_{18}O$ . It is an expectorant, antiseptic, and local anesthetic, useful in burns and ulcers, allaying pain, and promoting cicatrization of wounds. Internally it is probably also useful in catarrhal inflammation of the digestive tube (max. dose 1 cc.) and for inhaling purposes. *Apothesine*: A local anesthetic, used in 0.5% soln. of 0.4% NaCl containing adrenaline. Its chem. name is cinnamyl-diethylaminopropinol-HCl. *Brovadol* is bornyl Br-isovalerianate, an oily, colorless liquid of feebly aromatic odor,  $b_10$  163°, insol. in  $H_2O$ , sol. in EtOH,  $CHCl_3$  and  $Et_2O$ , containing 25.2% Br. It is used as a sedative for the nervous system. *Diemenal*: A soln. containing colloidal Mn, and used in treatment of malaria. *Elarson*, see C. A. 7, 866, 2065, 4013; 8, 1418; 9, 661. *Empyrom* is obtained by boiling birch tar with a soln. of HCHO, pouring the hot mixt. into HCl soln., cooling, collecting the solid mass and washing it free from the acid (Schering). It is a gray-brown powder, nearly odorless, insol. in  $H_2O$ , sol. in acetone and  $CHCl_3$ . It is antiprurient, sedative and siccative. It is recommended in eczema, psoriasis, urticaria, etc., in form of liniment containing 10% or it may be mixed with ZnO paste; or it may be used in the form of a 10% or 20% tincture. *Formicine*:  $AcNHCH_2OH$  is an equimol. compd. of HCHO and  $AcNH_2$ , a sirupy, slightly yellow liquid, with faint odor of HCHO and slightly acid, bitter taste, sol. in  $H_2O$ , EtOH,  $CHCl_3$ , glycerol, almost insol. in  $Et_2O$ . The solns., 1 to 5%, give off HCHO gradually at ordinary temp., hence are used as a local antiseptic; practically non-toxic; 5% solns. are but slightly irritant. *Glycarsenobenzol* is a mixt. of novarsenobenzol 0.2, guaiacol 0.1, stovaine 0.1 g. per cc., used by way of intramuscular injection in syphilis. *Ichthargan* has ichthyol as basis, with 30% Ag and 15% of organic S. To obtain it, neutralize ichthyol-sulfonic acid with  $Ag_2O$  and dissolve in  $H_2O$  the Ag salt formed. It is a brown, stable, amorphous powder, sol. in  $H_2O$ , glycerol, dil. EtOH, insol. in abs. EtOH,  $Et_2O$  and  $CHCl_3$ . It is thought to combine the properties of ichthyol with the antiseptic properties of Ag. It is decomposed by light and by chlorides. *Procaine*: The name given to novocaine made in U. S. *Sabromine*, or Ca-diBr-behenate,  $(C_{21}H_{41}Br_2COO)_2Ca$  is a colorless, odorless, insipid powder, insol. in  $H_2O$ , EtOH, sol. in  $Et_2O$ ,  $Me_2CO$ , PhH, ligroin and  $CCl_4$ . To prep. it, treat erucic acid with Br and convert into the Ca salt. It is a substitute for bromides, being less irritant than these to the mucous membrane of the stomach. Its action is not as rapid, but more prolonged. In the stomach, di-Br behenic acid is set free, which is absorbed in the intestine. *Siomine* is  $I_4$ -urotropic, containing 78.5% I; a substitute for org. I compds. *Sofos*: An effervescent mixt. of  $NaH_2PO_4$  and  $NaHCO_3$ , stabilized by coating one of these with  $Na_2HPO_4$ ; cf. C. A. 11, 2024. *Thermodine*,  $p-EtOC_6H_4NAcCO_2Et$ , is colorless, cryst., insol. in cold  $H_2O$ , and used as an analgesic, antipyretic and antiseptic in typhoid fever, pneumonia, influenza and tuberculosis. Though claimed to be non-toxic, it probably shares the harmful effects of other phenetidine derivs. *Triphenine*,  $p-C_6H_4OEt.NH.COEt$ , a white cryst. odorless, feebly bitter powder, m. 120°, nearly insol. in  $H_2O$ , sol. in EtOH and  $Et_2O$ , antipyretic, analgesic and hypnotic, of slower action than phenacetine. This compd. must also be used prudently; C. A. 10, 480. *Uropherine-B* is a double salt of Li benzoate and lithiated theobromine containing 50% of the latter; it is sol. in 5 parts of  $H_2O$  and is used as a diuretic in dropsy, nephritis, etc. *Uropherine-S* differs from the preceding in that Li salicylate takes the place of Li benzoate. The properties and uses are the same. *Double citrate of Sodium and Thorium* is used in radiology on account of its opacity to X-rays. Dissolve 10 g.  $Th(NO_3)_4$  in warm, boiled-out  $H_2O$ , add 30 cc. of a 50% aq. soln. of Na citrate; the ppt. formed at first is redissolved. Neutralize exactly with *N* NaOH and dil. to 100 cc. with  $H_2O$ , filter and sterilize.

S. WALDBOTT.

**The reactions of gold fish to certain habit-forming drugs—the use of the gradient tank.** V. E. SHELFORD. *J. Am. Pharm. Assoc.* 7, 597-603(1918).—The craving engendered by the use of habit-forming drugs is not understood. Most of the pharmacologic studies on habit-forming drugs have been made on mammals (a few have been on frogs) but almost none on the lower vertebrates. By chance S. discovered that fishes are peculiarly affected by numerous org. substances in aq. soln. when put under special exptl. conditions. The conditions are established in a tank 122 cm. long, 15 cm. wide and 13 cm. deep, in which water containing a drug flows into one end and out at both top and bottom, at the middle, while water which contains none of the drug flows into the other end at the same rate. The two flows meet at the middle and with most substances there is a mixt. of the two kinds of water which occupies the center third of the tank. In this mixt. a fish moving from the pure water end toward the drug-containing end encounters a gradual rise in concn. of the drug. This region of change of concn. is called the gradient. The character of the gradient in these tanks has been fully detd. by taking samples, by measuring cond., and by the use of colored water. If a fish encounters no change in water, it moves freely back and forth without showing preference for either end of the tank. If it encounters water containing an excess of  $\text{CO}_2$ , it backs away and starts again, often repeating the operation before going forward. It gives other evidence of stimulation. The opercles are lifted, the lower jaw protruded, or the mouth moved in a yawning, coughing or gulping motion. When a fish enters a soln. containing EtOH, cocaine, morphine or any one of several other substances tried, there is no apparent rejection of the drug, but on the contrary, after a time the fish is found to have a preference for the drug-containing end of the tank. With cocaine-HCl the fishes, after a short exposure, refused to leave the drug soln., soon became intoxicated and died. With EtOH the fishes reacted more and more positively as the concn. increased up to 10%. The expt. was discontinued because the subjects became semi-intoxicated. In 20% EtOH the fishes avoided the full strength but still reacted positively. With morphine-HCl no preference is shown in concns. of 0.15 g. per l. In 1 g. per l. positive preference was shown by one individual but not by another. Some individuals avoided the strongest solns. of morphine. With naphthalene in half-satd. and in satd. solns., the fishes reacted positively although they died after a time. Some species of minnows were less sensitive to EtOH than goldfish. A tadpole in 20% EtOH showed a positive reaction. The gradient tank may afford a valuable means of studying "habit" formation and of investigating compns. or combinations of drugs to det. those having the desired therapeutic effects with the least danger of habit formation.

L. E. WARREN.

**Bacteriology—its relations to pharmacy and allied sciences.** L. GERSHENFELD. *J. Am. Pharm. Assoc.* 7, 605-7(1918).—Discussion.

L. E. WARREN.

**The use of saccharin as a sugar substitute.** S. T. HENSEL. *J. Am. Pharm. Assoc.* 7, 607-19(1918).—Discussion.

L. E. WARREN.

**Inversion of sugar in U. S. P. sirup.** G. W. L. PLETTE. *J. Am. Pharm. Assoc.* 7, 609-10(1918).—Specimens of sirup were made by the "hot" and the "cold" methods, stored under various conditions of light and temp. for several months, and the amt. of invert sugar was detd. from time to time. The specimens stored in a cool, dark place were inverted the least and showed less yeasts and molds. *Penicillium glaucum* is believed to be the chief cause of the inversion. P. concludes that sirup should be stored in full bottles in a cool, dark place and shaken daily. The rate and the amt. of inversion are apparently independent of whether the hot or the cold method of prepn. has been used.

L. E. WARREN.

**Variations in nux vomica and its preparations.** H. H. SCHAEFER. *J. Am. Pharm. Assoc.* 7, 687-8(1918).—See C. A. 12, 2407.

L. E. WARREN.

### Distinctive properties and classification of organic and colloidal silver compounds.

T. SOLLMANN. *J. Am. Pharm. Assoc.* 7, 677-86(1918).—By an extensive investigation which included a consideration of the appearance, the total Ag present, the irritation to the nostrils and conjunctival sac produced by a 10% soln., tests for pptn. with egg albumin, color of the filtrate after treatment of the soln. with hydrated Al silicate (Lloyd's reagent), tests for free Ag ions, soly., viscosity and d. of 25% soln., color of 1-1000 soln. compared with 0.1 N  $K_2Cr_2O_7$ , transparency by reflected light, Ag color index and nature of the protein, the various colloidal Ag compds. of the market were classified into groups. The *Collargol group* comprizes Collargol and Cargentos; the *Argyrol group*, Argyrol, Squibb's Silver Protein, Sophol, Silvol and Solargentum; the *Protargol group*, Protargol, Roche's Silver Protein, Heyden Silver Protein and Hegenon; the *free silver group*, Albargin and Roche's Silver Nucleinate; and the *pale group*, Novargan and Argonin. The results are tabulated. L. E. WARREN.

### Standardization of pituitary extract and other drugs. REYNOLD A. SPAETH.

Yale Univ. *J. Pharmacol.* 11, 209-20(1918); *Physiol. Abstracts* 3, 331.—A method is described, in which the "killiefish" or mummrechog, *F. heteroclitus*, a common minnow of the Atlantic coast is used. When a scale with widely expanded melanophores is placed in a pituitary soln. the melanophores contract completely, the time required being a function of the concentration of the extracts. KCl is used as a standard. Details are given. C. J. WEST.

The course of digitalis poisoning in the frog as a method of evaluation of digitalis preparations. R. GOTTLIEB. *Arch. exp. path. pharm.* 83, 117-56; *Physiol. Abstracts* 3, 272.—The stillstand of the frog's ventricle after injection of active digitalis glucosides passes off after a variable time especially in summer frogs. A detoxication must therefore occur in the frog's body somewhere. Differences in recovery time are noted in relation to mode of administration (subcutaneous, intravenous) and with the glucoside employed or its solvent and the method is suggested as a means of evaluation of preps. C. J. WEST.

Cresol preparations. C. A. NICORESTI. *Brit.* 118,667, Sept. 3, 1917. Cresol and mixts. of cresol and HCHO are solidified by the addition of Na stearate or animal soap and cast into tablets to be dissolved in  $H_2O$  or alc. for disinfecting and medicinal purposes. Crude or refined cresol is incorporated with about 10% of its wt. of stearate by heating to the b. p. with or without the application of pressure. The mixt. of cresol and HCHO to be similarly solidified may be prepd. by the addition of formalin soln. to the cresol, or by submitting the cresol to a current of HCHO gas until it has absorbed a tenth of its wt. Coloring and perfuming ingredients, such as oil of roses, may be added. According to the provisional specification, fatty acid and alkali may be added to sep. portions of the cresol, to be mixed and heated afterwards, and small quantities of wax or hard paraffin may be added to accelerate the process of solidification.

### Synthetic adrenaline. NAGAYOSHI NAGAI. *Brit.* 118,298, July 13, 1917.

Adrenaline is obtained by the following synthesis: (1) Diacetylprotocatechuic aldehyde, prepd. by the reaction of  $AcCl$  or  $Ac_2O$  on protocatechuic aldehyde, is condensed with nitromethane in the presence of weak inorg. or org. bases; (2) the resulting diacetyldihydroxyphenylnitroethanol is reduced in the presence of HCHO by means of Zn dust and HOAc; (3) the diacetyladrenaline so formed is hydrolyzed by HCl, giving adrenaline hydrochloride.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**Mining and calcining magnesite in Napa, California.** ANON. *Mining Sci. Press* 117, 459-60(1918).—In 1917, Napa Co., Cal., contributed 19% (40,218 tons) of the total crude magnesite mined in California. The White Rock Mine at Napa is situated at an elevation of 1200 ft. and is 500 ft. above the calcining plant. All broken ore passes down chutes to the adit. From the outlet of the mine the ore is run over a 2" grizzly. The oversize goes directly to the kilns. The undersize goes to a revolving trommel with 1 1/4" perforations. The oversize from this goes to the kilns and the undersize is dumped on a 1 1/4" shaking wire screen. What passes through this is discarded, being high in SiO<sub>2</sub> content. Between the mine and the calcining plant, a distance of 5000 ft., is a 500 ft. fall. An aerial tram carries the ore to the kilns. The crude ore analyzes SiO<sub>2</sub> 1.94%, Fe<sub>2</sub>O<sub>3</sub> 1.49%, CaO 0.67%, MgO 45.01%, CO<sub>2</sub> 50.65%. The calcining plant consists of 11 vertical kilns having steel jackets lined with 13" of fire-brick. Alternate layers of coke and MgCO<sub>3</sub> in the proportion of 1 to 12 are dumped into the kilns from the charging floor. Natural draft suffices to burn the ore in 24 hrs. The burned ore analyzes SiO<sub>2</sub> 4.60%, Fe<sub>2</sub>O<sub>3</sub> + Al<sub>2</sub>O<sub>3</sub> 4.46%, CaO none, MgO 90.46% and loss on ignition 0.48%. The MgO produced being high in Fe<sub>2</sub>O<sub>3</sub> is desirable for refractory purposes. The mine produces monthly 3500 tons of crude MgCO<sub>3</sub> and 1750 tons of calcined product. E. A. TSCHUDY.

**The potash industry of Germany.** W. SAVAGE. *Chem. Met. Eng.* 19, 453-6 (1918).—A brief review, with analytical data, soly. curves, diagrams, statistical data, etc. The theories of the origin of the Stassfurt deposit, a description of the deposit, the present status of the industry and its economic aspect are considered.

F. W. SMITHER.

**Recovery of potash from kelp.** C. A. HIGGINS. *J. Ind. Eng. Chem.* 10, 832-3 (1918); *Chem. Met. Eng.* 19, 432-3(1918).—A brief review and discussion, followed by an outline of the process used by the Hercules Powder Co.

F. W. SMITHER.

**The kelp-potash plant of the Lorned Manufacturing Company.** L. H. THOMPSON. *Chem. Met. Eng.* 19, 450-2(1918).—A description, with illustrations, of the plant and its operation. About 6 tons per day of a product (a grayish charcoal) containing 35% K<sub>2</sub>O are produced, other possible products being lost by the method used (drying and incinerating). The output of the plant is sold as a fertilizer. Furnace gases and moisture are drawn off from the rotary dryers by suction fans placed at the discharge end. A similar fan is used at the end of the incinerators (oil-fired) to produce a draft necessary to complete combustion. The flues from the dryers and incinerators lead to a series of brick chambers where the velocity of the dust-laden gases is reduced to such a point that nearly all the dust is pptd. At the end of the dust chamber the smoke passes through sprinklers to wash it thoroughly before allowing it to escape into the air. An av. of 15 tons of dust, having a content of 30% K<sub>2</sub>O, is recovered from the dust chambers each month.

F. W. SMITHER.

**A wet process for extracting potash from cement dust.** J. G. DEAN. *Chem. Met. Eng.* 19, 439-47(1918).—A detailed description, with drawings, curves, flow sheets, calcs., etc., of an exptl. plant operated by the Southwestern Portland Cement Co. at Victorville, Calif., for the pptn. of K-bearing dust from cement kilns by a humidifying process. One ton of K<sub>2</sub>SO<sub>4</sub> is made per day. From the data obtained, a permanent installation has been designed. A diagrammatic layout and a flow sheet of the proposed permanent installation are shown. The chemistry of the process is outlined as follows: "The K and Na in the feldspar and other minerals contained in the cement rock mixt. are volatilized as oxides to a certain extent by the intense heat in the clinker-

ing zone, and probably react with  $\text{SO}_2$  (formed from S in the fuel) to form sulfates. After these reactions take place near the focus, if the sulfates pass on into a reducing atm. (CO) sulfides will be formed. Thiosulfates and carbonates are also formed in the hot, humid gases. On reaching the spray chamber, the gases bear particles of fume consisting in part of K and Na sulfides, sulfates, and thiosulfates, together with some complex polysulfides. The  $\text{H}_2\text{O}$  which washes these particles out of the gas also absorbs  $\text{CO}_2$ , forming some bicarbonates; these latter rapidly oxidize any remaining sulfides ( $\text{K}_2\text{S} + 2\text{KHCO}_3 = 2\text{K}_2\text{CO}_3 + \text{H}_2\text{S}$ ). The  $\text{H}_2\text{S}$  rapidly hydrolyzes to  $\text{H}_2\text{O}$  and S, which latter reacts with any sulfite, which may rarely be present ( $2\text{Na}_2\text{SO}_3 + 2\text{S} = 2\text{Na}_2\text{S}_2\text{O}_3$ ). A considerable quantity of this S also condenses on the sides of the stack through which the spent, cool kiln gases eventually escape. Therefore, the mixed spray chamber sludge and condensate contain in soln. principally the following ions:  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{CO}_3^{--}$ ,  $\text{S}_2\text{O}_3^{--}$ , and  $\text{SO}_4^{--}$ . The solns. are drawn through a bed of gypsum to remove the  $\text{CO}_3^{--}$ , the  $\text{CaCO}_3$  formed being insol. To prevent overloading the evapg. system with  $\text{CaSO}_4$  (which is sol. in thiosulfate), a little  $\text{CO}_3^{--}$  should remain in the soln. after gypsum treatment (this is carried out under chem. control). On evapg. the soln. the double salt  $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 \cdot 1/2$  to  $1 1/2$   $\text{H}_2\text{O}$  is obtained, together with  $\text{K}_2\text{SO}_4$ . In actual practice the salts as they come from the crystallizer-evaporator are dried and heated to remove a part of the S of the thiosulfates, giving a product of about 90%  $\text{K}_2\text{SO}_4$ . The formation of the double thiosulfates can be prevented by adding enough  $\text{Na}_2\text{SO}_4$  to furnish the necessary amt. of  $\text{SO}_4^{--}$  for the  $\text{K}^+$  present in excess. This salt also furnishes the requisite amt. of  $\text{Na}^+$  for the  $\text{S}_2\text{O}_3^{--}$ . Pure  $\text{K}_2\text{SO}_4$  will then crystallize from boiling solns. up to the point of satn. of the Na salt. Now if these hot solns. are drained into a crystallizing tank and allowed to cool,  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  will crystallize, while the  $\text{K}_2\text{SO}_4$  remaining in the mother liquor can be returned to the primary evaporator."

F. W. SMITHER.

**Recovery of potash from iron blast furnaces and cement kilns by electrical precipitation.** L. BRADLEY. *J. Ind. Eng. Chem.* 10, 834-8(1918); *Chem. Met. Eng.* 19, 457-60(1918).—A review and discussion with analytical data, calns., costs, etc. A bibliography is appended.

F. W. SMITHER.

**Potash from desert lakes and alunite.** J. W. HORNSEY. *J. Ind. Eng. Chem.* 10, 838-9(1918); *Chem. Met. Eng.* 19, 461-2(1918).—A brief review and discussion.

F. W. SMITHER.

**Potash as a by-product.** J. S. GRASTY. *Chem. Met. Eng.* 19, 434-8(1918).—A detailed review and discussion, with illustrations, analysis of raw materials, estd. cost of operation, probable recovery and profits, of the value of Southern Fe ores and fluxes as a domestic source of  $\text{K}_2\text{O}$  in large quantities. The only large tonnage of K-bearing Fe ores known in this country occurs in eastern Ala. The ores of the Weewooka and Eumauhee districts contain 1.5 to 3.0%  $\text{K}_2\text{O}$ , those of the Columbiana district, 1.0 to 1.25%  $\text{K}_2\text{O}$ .

F. W. SMITHER.

**Potash in Nebraska.** J. M. LLITERAS. *Chem. Met. Eng.* 19, 633-4(1918).—A brief review of the conditions at the plants producing K salts from lake brines. Nebraska is now producing about 450 tons of salts daily, with an av.  $\text{K}_2\text{O}$  content of 25%. This production is expected to be further increased in the near future. Cf. Thum, C. A. 12, 296; Norris, C. A. 12, 1035.

F. W. SMITHER.

**Potash from Searles Lake.** A. DE ROFF, JR. *J. Ind. Eng. Chem.* 10, 839-44(1918); *Chem. Met. Eng.* 19, 425-31(1918).—A detailed description, with illustrations, analytical and statistical data, etc., of the American Trona Corp'n.'s operations and plant. With recently installed equipment, the company will produce about 4500 tons of K salts per month, analyzing from 75 to 80% KCl and containing less than

3.5% borax. By the first of 1919 there will be a daily output of 40 to 50 tons of refined borax (99.5%  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ). F. W. SMITHER.

**Hydrogen peroxide.** J. FRÈRE. *Rev. prod. chim.* 21, 211-4(1918).—A review and discussion of the patented processes for the manuf. of  $\text{H}_2\text{O}_2$ , e. g., the Thénard ( $\text{BaO}_2$ ) process and its modifications, the use of  $\text{Na}_2\text{O}_2$ , persulfates, percarbonates, perborates, direct synthesis, catalytic processes, prepn. of pure  $\text{H}_2\text{O}_2$  from the industrial product, distn., and stabilization. The article cannot very well be abstracted. F. W. S.

**Synthetic nitrogen products.** G. MORSELLI. *Chem. Trade J.* 63, 182(1918).—The cyanamide industry underwent extensive expansion during the first two years of the war. In 1914 the production was 194,762 tons and in 1916, 981,500 tons. In Italy the production of synthetic  $\text{HNO}_3$  has remained stationery and that of  $\text{CaCN}_2$  has not greatly increased. The arc process is only of value in countries like Norway where the cost of installation is \$40.00 per H. P. and the working expenses \$1.50 to \$2.00 per H. P. per annum. In Italy the corresponding figures are \$200 to \$300 and from \$15.50 to \$20.00, respectively. The cyanamide process offers great advantages despite the difficulty represented by the coal problem, which is serious in Italy. The Haber process seems to have been surpassed by the method of the General Chem. Co. which directly synthesizes  $\text{NH}_3$  from N and H. This company produces H very cheaply and this is of the greatest importance for the synthesis of  $\text{NH}_3$ . As Germany in future will not purchase any natural nitrate, and England, France, Italy and the U. S. are seeking to become independent of nitrate, the Chilean Govt. will probably be compelled to discontinue the export duty provisionally, either partially or entirely and the price will perhaps fall. The result of this would be to stimulate the Italian N industry to utilize the cheapest hydro-elec. power and the most economical methods of production.

E. A. TSCHUDY.

**The Salters' Institute of Industrial Chemistry.** ANON. *Nature* 102, 147-8 (1918).—A review is given of the announcement by the Salters' Company of an institute to be established for the promotion of scientific education and research by the provision of fellowships tenable by graduate workers.

ALBERT R. MERZ.

**Chemical products and processes.** WM. A. TILDEN. *J. Soc. Dyers Colourists* 34, 199-200(1918); *British Sci. Products Exhibition Catalogue* p. 7.—The subject is discussed under (1) heavy chemicals; (2) fine chemicals; (3) application of chemistry to arts and manufactures. In the 1st British manufacturers had maintained the lead but Germany had gradually developed almost a complete monopoly upon the 2nd at the beginning of war, and the position of the British chemical industry in August 1914 was very serious. British chemists and manufacturers have arisen to the occasion and the country is now receiving all that is essential in dyes, drugs, and chemicals. In the 3rd the chief developments have been in production of H for air ships, fixation of N, hardening of oils by hydrogenation, production of synthetic drugs including organo-arsenic compds., poisonous gases for warfare and recovering of K from waste furnace gases.

L. A. OLNEY.

**Calculation of extraction in continuous agitation.** A. HAM AND H. S. COE. *Chem. Met. Eng.* 19, 663-6(1918).—The authors show the derivation of a mathematical formula for continuous systems of extn. in hydrometallurgy and industrial chemistry, and give examples of its application.

F. W. SMITHER.

**The use of microorganisms in chemical industry.** E. G. GENOUD. *Chem. Met. Eng.* 19, 616-7(1918).—An account of the application of yeasts, molds and bacteria in industrial org. chemistry with an outline of future possibilities that await research. The subjects treated include alc. fermentation and lactic and butyric acid manuf.

E. A. TSCHUDY.

Determination of nitrates in caliche and its products (CLENNELL) 7. Useful substances from corn cobs (LA FORGE) 28.

**Sodium aluminate, sodium carbonate, and alumina.** E. E. DUTT and P. C. DUTT. Brit. 118,156, Aug. 18, 1917. A mixt. comprizing specified proportions of calcined bauxite or like aluminous substance,  $\text{NaCl}$ ,  $\text{Ca(OH)}_2$ , and C is heated in a muffle to dull redness and submitted to the action of the vapor of  $\text{As}_2\text{O}_3$ . The charge from the muffle is lixiviated with  $\text{H}_2\text{O}$ , yielding a soln. of Na aluminate which may be evapd. to dryness and obtained as such or may be treated with  $\text{CO}_2$  to yield a ppt. of  $\text{Al(OH)}_3$  and a soln. of  $\text{Na}_2\text{CO}_3$ . The  $\text{Al(OH)}_3$  is washed, dried, and calcined, yielding  $\text{Al}_2\text{O}_3$ , and the  $\text{Na}_2\text{CO}_3$  soln. evapd. to dryness.

**Alkali cyanides.** G. CALVERT. Brit. 116,365, June 12, 1917. In the production of alkali cyanides by the reaction of N and C on an alkali metal or alkali metal compd. in the presence of Fe, the metal catalyst is produced *in situ* from Fe carbonyl, which may be prepd. in admixt. with N by passing producer gas over finely divided Fe or may be sep. prepd. and introduced into the reaction. A suitable app. is specified.

**Ammonium sulfate.** T. TURIYAMA. Brit. 116,321, May 31, 1917.  $\text{NH}_3$  and  $\text{CO}_2$  are introduced into  $\text{Na}_2\text{SO}_4$  soln.;  $\text{NaHCO}_3$  seps.  $\text{H}_2\text{SO}_4$  is added to the mother liquor to convert dissolved bicarbonate and free  $\text{NH}_3$  into sulfates, and the soln. is then evapd. and cooled to sep. out the  $\text{Na}_2\text{SO}_4$ , which is used again, leaving  $(\text{NH}_4)_2\text{SO}_4$  in soln.

**Aluminium chloride; alumina.** R. WELFORD. Brit. 118,312, Aug. 18, 1917. Clay, bauxite, or the like, which may be dried at a low temp., is heated with  $\text{HCl}$  to dissolve the Al. The soln. sepd. from the residues may be purified, and is evapd. to dryness. The crystals are then further heated with steam to produce  $\text{Al}_2\text{O}_3$ , the  $\text{HCl}$  expelled being recovered. Al may be obtained by known methods from the  $\text{Al}_2\text{O}_3$ .

**Alumina.** MINERAL PRODUCTS CORPORATION. Brit. 118,063, Feb. 27, 1918. Impure  $\text{Al}_2\text{O}_3$  resulting from the calcination and leaching of alunite is purified by mixing it in a finely divided condition with  $\text{H}_2\text{O}$  to form a pulp, and subjecting the pulp to a flotation process in any suitable app. such as a Callow, Hoover, or Janney cell, with or without the use of a frothing agent, such as oleic acid.

**Potassium aluminate, potassium carbonate, and alumina.** E. E. DUTT and P. C. DUTT. Brit. 118,155, Aug. 18, 1917. A mixt. comprizing specified proportions of calcined bauxite or like aluminous substance,  $\text{KCl}$ ,  $\text{Ca(OH)}_2$ , and C is heated in a muffle to dull redness and submitted to the action of the vapor of  $\text{As}_2\text{O}_3$ . The charge from the muffle is lixiviated with  $\text{H}_2\text{O}$ , yielding a soln. of K aluminate which may be evapd. to dryness and obtained as such or may be treated with  $\text{CO}_2$  to yield a ppt. of  $\text{Al(OH)}_3$  and a soln. of  $\text{K}_2\text{CO}_3$ . The  $\text{Al(OH)}_3$  is sepd. and the  $\text{K}_2\text{CO}_3$  soln. evapd. to dryness.

**Drying salt.** T. W. S. HUTCHINS. ELECTRO-BLEACH & BY-PRODUCTS, LTD. Brit. 118,712, Oct. 5, 1917.  $\text{NaCl}$  is dried in app. consisting of a series of superimposed heated cylinders through which it is successively traversed by high-speed rotary conveyers. Details of construction and operation are specified.

**Decolorizing carbon.** H. M. SHILSTONE. Brit. 116,253, July 26, 1917. Decolorizing C is formed by carbonizing fibrous cereal material, rich in  $\text{SiO}_2$ , such as rice hulls, straw, or chaff, wheat or oat straw, esparto, outer shells of corn stalks, sugarcane fibers, etc., by heating gradually to a glowing redness out of contact with O. The carbonized material is boiled with an alk. material such as  $\text{NaOH}$  or  $\text{Ca(OH)}_2$ ,  $\text{MgO}$ , or carbonates of alkali metals or alk.-earth metals, to dissolve out resinous matters, and is then washed and boiled with acid. When alk.-earth oxides or car-

bonates are used these may be mixed with the materials before carbonization. The decolorizing carbons may be used for decolorizing sugar-cane juices in neutral or alk. soln., and to remove the polyphenols and tannins from the juices. Cf. 21,204, 1911 (C. A. 7, 1115), 19,357 1912 (C. A. 8, 557), and 17,432, 1913 (C. A. 9, 697).

**Zinc oxide.** H. MACONCHIE. Brit. 118,665, Sept. 1, 1917. ZnO is produced by blowing heated air or O on to or into melted Zn or a mixt. contg. Zn, the supply of heat being discontinued when the reaction has started. The process may be combined with the extn. of Zn from ZnS ore by means of Fe, the ZnS being mixed with scrap Fe and melted, and the heated air being blown upon or into the molten mass. Additional quantities of Zn or Zn ore and Fe are added gradually to avoid lowering the temp., and may be preheated. The heating of the reaction mass may be effected by an oil burner or by an elec. resistance. Additional air may be supplied to the oxide fume to complete the oxidation. The surplus heat of reaction is used to heat, in an adjacent chamber adapted for the purpose, the air required for the reaction.

**Tin oxide.** H. MACONCHIE. Brit. 118,664, Sept. 1, 1917. SnO<sub>2</sub> is obtained by blowing heated air or O upon or into melted Sn, the supply of heat being stopped when the reaction has started. The Sn may be melted by an oil burner or an elec. resistance, and the air and additional Sn may be preheated by the heat of reaction.

**Titanium products; pigments.** TITAN & CO. Brit. 116,266, Apr. 10, 1918. Materials for use as pigments, and for other purposes such as for heat-insulating or for ceramic use, are made from Ti hydroxides which have been pptd. from sulfate or other acid solns., and so contain H<sub>2</sub>SO<sub>4</sub> or other acid by treatment with basic material, such as CaCO<sub>3</sub>, to produce an insol. sulfate, etc. The reaction should be accompanied by the evolution of gas, to render the product porous and homogeneous. The proportion of basic substance may be altered in order to obtain, after calcination, a product contg. some Ca titanate, if desired. Where the mixt. of Ti compd. and CaSO<sub>4</sub> is to be used as a pigment, it is calcined to drive off the H<sub>2</sub>O of hydration, and calcination is continued until the Ti oxide is converted into a cryst. modification.

**Separating solids from liquids.** N. PEDERSEN. Brit. 119,028, Aug. 1, 1918. Solid particles are sepd. from liquid in which they are suspended by means of air or gas bubbles, the air or gas being introduced into the liquid under pressure and liberated at atm. pressure. The process is applicable to the sepn. of wood fibers from the effluent H<sub>2</sub>O from wood pulp plant, and to known methods of sepg. ores.

**Dental cements.** W. S. CROWELL. Brit. 118,701, Sept. 26, 1917. Ag salts are incorporated with dental cements for tooth-stopping or for setting crowns, etc., so as to exert antiseptic effects and to prevent the recurrence of decay. Ag<sub>3</sub>PO<sub>4</sub> may be mixed with the powder of an ordinary Zn hydroxyphosphate cement, or the phosphate, carbonate, oxide, or other salt of Ag may be dissolved in the H<sub>3</sub>PO<sub>4</sub> soln. with which the cement powder is mixed for use. This soln. may also contain Zn<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>, AlPO<sub>4</sub>, and Na<sub>2</sub>HPO<sub>4</sub>. In place of Ag<sub>3</sub>PO<sub>4</sub>, other salts such as borate, silicate, chloride, bromide, or iodide may be employed.

**Dental cements.** W. S. CROWELL. Brit. 118,702, Sept. 26, 1917. Hg salts are incorporated with dental cements for tooth-stopping and for setting crowns, etc., so as to exert an antiseptic action and to prevent the recurrence of decay. A Hg phosphate or other mercurous or mercuric compd., such as an oxide, sulfide, chromate, or carbonate, is added to the powder or to the H<sub>3</sub>PO<sub>4</sub> soln. of an ordinary hydroxyphosphate of Zn cement. The acid soln. may contain in addition, the phosphates or oxides of Na, Zn, or Al.

**Abrasives.** NORTON CO. Brit. 118,591, Feb. 7, 1918. An aluminous abrasive having a weak grain and contg. crystals which are perforated or cellular is obtained



by fusing an aluminous material with a small proportion of a substance capable of existing in the vapor phase at the temp. at which the charge solidifies. The substances used comprize Na, K, or other alkali metal compds., such as  $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{NaAlO}_2$ ,  $\text{AlF}_3$ , and Zn powder. From 1 to 5% of the Na compd., reckoned as  $\text{Na}_2\text{O}$ , is used. The aluminous material may consist of pure  $\text{Al}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$  contg.  $\text{SiO}_2$ , or bauxite.

**Abrasives.** NORTON CO. Brit. 118,592, Feb. 7, 1918. An aluminous abrasive having a fine grain of weak structure is obtained by fusing bauxite with a small proportion, *e. g.*, 2-3%, of an alkali metal compd. Soda ash is preferred, but the sulfates, carbonates, hydroxides, or aluminates of Na or K may be used. The proportion of the impurities present in the bauxite, namely  $\text{SiO}_2$ ,  $\text{Fe}_2\text{O}_3$ , and  $\text{TiO}_2$ , may be reduced by incorporating in the charge a quantity of coke or other form of C.

**Plastic compositions.** R. Y. ARDAGH. Brit. 118,768, Jan. 4, 1918. Silicate cotton is prepd. for admixt. with a soln. of Na or K silicate by first sepg. it into three grades, namely (1) wool fiber; (2) "vitric metalline globules, being the heavy mineral matter ranging in size from a grain of wheat to a grain of sand;" (3) slag dross and vitrified coke-like pieces. Nos. 1 and 2 only are utilized, being comminuted separately before mixing with a soln. of water-glass, etc., of 70° Tw. The compn. may be spread over inflammable and flexible materials to convert them into stiff sheets, or may be molded into boards, etc., or poured into molds of wire netting encased by cardboard, bast matting, etc., or between sheet linings for ship and like construction. The compn. may be mixed with granulated and like materials such as sawdust, cork, spent tar, coconut fiber, peat fiber, and other vegetable fibers.

**Washing coal, ores, etc.** T. M. CHANCE. Brit. 119,038, Sept. 9, 1918. Materials of different sp. gr. are washed, concd., or sepd. by means of an agitated fluid mixt. of a liquid such as  $\text{H}_2\text{O}$  and a granular solid such as sand surmounted by a body of liquid such as  $\text{H}_2\text{O}$ . A suitable app. is specified.

**Metal polish.** W. H. ALLEN. U. S. 1,280,939, Oct. 8. A mixt. for coating and polishing Fe or other metals is formed of graphite 16, lampblack 3 parts and sufficient dil.  $\text{H}_3\text{PO}_4$  to form a thin paste.

**Heat-insulating material.** J. K. TOLLS. U. S. 1,281,097, Oct. 8. Rice straw is partially purified by treatment with a dil. alkali soln. and heating, washed, mixed with uncooked material such as chopped tule in  $\text{H}_2\text{O}$  and the mixt. is formed into sheets for use as a heat-insulating material.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

**Wear-resisting values of various aggregates for concrete roads indicated.** H. S. MATTIMORE. *Eng. News-Rec.* 80, 861(1918).—Tests were made with a machine designed to generate impact stresses which parallel those set up by traffic. Summary of results indicated that (1) crushed stone remains intact and resists impact better than gravel; (2) although a good matrix has a tendency to support a weak coarse aggregate the use of a good quality of the latter will make a more durable pavement; (3) a coarse-grained mortar resists impact better than a mortar made with finer-grained sand.

H. A. BRIGHT.

**Portland cement construction for chemical works.** M. TOCH. *Chem. Met. Eng.* 19, 487(1918).—Through the use of special coatings portland cement is being used extensively in chem. works. Concrete finished with acid-proof brick linings set in a heavy bituminous binding material is used for acid storage and niter cake.

H. A. BRIGHT.

**Reinforced concrete versus salt, brine and sea water.** H. J. M. CREIGHTON. *Chem. Met. Eng.* 19, 618-23(1918).—Examples of failures of reinforced concrete are given, the cause being due to electrolytic corrosion of the reinforcing steel (cf. C. A. 12, 415). C. suggests the use of the Schoop metal-spraying process for waterproofing to prevent corrosion of reinforcement. H. A. BRIGHT.

**Electricity in the cement industry.** R. B. WILLIAMSON. *Elec. Rev. West Elec.* 73, 813-4(1918).—Contains many data of interest to chem. engineers. C. G. F.

**Recovery of potash from cement kilns (BRADLEY) 18.** Wet process of extracting potash from cement dust (DEAN) 18.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Remarks on the rule of Dulong.** C. T. S. *Het Gas* 38, 236-9(1918).—The Dulong formula for the calcn. of calorific value of coal, while not scientifically accurate, is sufficiently reliable for practical work. In most cases it can be made more accurate by regarding all the H as free and combustible (omitting the factor H/8), and by adding the factor 2500 S, to allow for the combustion of the S present. This gives it in the form  $(8080 C + 34500 H + 2500 S)/100$ , which gives higher figures than the old form. In most cases, this is in accord with facts. No accurate rule can be formulated till it can be established which constituents of coal are endothermic and which are exothermic. JULIAN F. SMITH.

**Use of the hydrogen-volatile-matter ratio in obtaining the net heating value of American coals.** A. C. FIELDNER AND W. A. SELVIG. *Bur. Mines Tech. Paper* 197, 13 pp.(1918).—The standard methods of analyzing coal as given by the Am. Soc. Testing Materials state that "the results of detns. of caloric power shall be stated either as 'total' heat of combustion or 'net' heat of combustion." Total heat of combustion is defined as the direct result obtained in the bomb calorimeter with the water vapor in the products of combustion condensed to liquid water at the temp. of the calorimeter, that is, from 20 to 30°. Net heat of combustion at 20° is defined as the heat developed on complete combustion of a unit wt. of fuel with the water in the products of combustion passing off as vapor at 20°, and is calcd. as follows: Net heat of combustion in cal. = total heat of combustion —  $[(\% H \times 9 \times 580)/100]$ . It is seen that the detn. of net heat of combustion involves a H detn. as well as a calorimetric one. Since the H content of coals is roughly proportional to the volatile matter present, it was thought that the H content of coals could be estd. accurately enough from the percentage of volatile matter. From the analyses of 2000 coals of wide occurrence, the relation existing between the H content and the volatile matter was established. By the use of curves showing this relation the H content of bituminous, semibituminous and anthracite coal may be estd. from the volatile matter to within 0.6%. For sub-bituminous coal and lignite the limits of deviation should be extended to 0.8%. In most coals the error in the net heat of combustion calcd. in the manner presented will not exceed 0.5%, which is no larger than errors incurred in sampling coal.

J. H. YOUNG.

**Coal economics.** G. BASTIEN. *L'Industrie chimique* 5, 221-5(1918).—A review and discussion (mainly mathematical) of the methods that have been proposed for the economical production of steam. F. W. SMITHER.

**Notes on lignite, its characteristics and utilization.** S. M. DARLING. U. S. Dept. Interior, Bur. Mines, *Tech. Paper* 178, 17 pp.(1918).—"This short summary of present information on the compn. and utilization of lignite is issued by the Bur. of

Mines for the purpose of outlining problems that are of immediate and urgent importance to the maintenance of industrial activity, and the upholding of the utmost efficiency in the conduct of the war." Cf. *C. A.* 11, 2536. F. W. SMITHER.

**Loss of volatile matter in the moisture determination in lignite.** H. L. KROFF. Amsterdam. *Hel Gas* 38, 233-4 (1918).—By quant. absorption of  $H_2O$  in  $CaCl_2$  tubes, it was found that part of the loss detd. as moisture is org. volatile matter. This amounted in 1 sample, after 6 days' air drying, to 1.3% of the wt. of the sample; and to 7.3% after oven drying at  $110^\circ$ . Probably the chief loss consists of volatile humus acids, with small amts. of  $CH_4$ . JULIAN F. SMITH.

**Partial separation of water and tar from lignite.** H. VAN DER WOUDE. *Hel Gas* 38, 234-6 (1918).—The chief objection to coking lignite is the large amt. of steam evolved, which causes difficulty of manipulation and lowers the quality of the  $NH_3$  liquor and the tar. By suitable arrangement of a battery of 4 ovens, with provision for drawing off the steam, it was found possible to obtain a good yield of a fair quality of gas by coking lignite in 3 ovens and a good coal in the other. With proper distn. facilities, the quality of the  $NH_3$  liquor and the tar can be maintained also.

JULIAN F. SMITH.

**Apparatus for measuring chimney heat loss, and the factors causing this loss.** MARCEL CHOPIN. *Compt. rend.* 167, 335-8 (1918).—An app. was designed for simultaneously measuring temp.,  $CO_2$  content of the flue gases, and heat loss in the flue. The heat loss is calcd. by the formula:  $P = K(T_2 - T_1)/A$ , in which  $P$  is the heat loss in % of the calorific value of the fuel used,  $T_1$  the temp. of air entering the furnace,  $T_2$  the temp. of the flue gas leaving the chimney,  $A$  the % of  $CO_2$  in the flue gas, and  $K$  a proportionality const. The  $CO_2$  content was measured by the change in elec. cond. of the  $NaOH$  absorbing soln. The app. is so arranged that the pyrometer and the  $CO_2$  indicator can be read simultaneously. The method is accurate enough for industrial work and yet does not require a technically trained expert. An automatic recording indicator of heat loss is being devised. IRENE F. SMITH.

**Low-rate combustion in fuel beds of hand-fired furnaces.** H. KREISINGER, C. E. AUGUSTINE AND S. H. KATZ. Bur. Mines, *Tech. Paper* 139, 54 pp. (1918).—This paper presents the results of a study of the process of combustion in the fuel bed of hand-fired furnace when burning coal at such low rates of combustion as are used in house-heating app. The study is an extension of the work previously reported (cf. *C. A.* 11, 1740) which covers the higher rates of combustion, such as are used in burning coal under power plant and locomotive boilers. That report deals with rates of combustion of 20 to 180 lbs. of coal per sq. ft. of grate per hr., whereas this paper covers the rates below 20 lbs. The same app. and largely the same methods were used in both cases. **Conclusions:** "The processes taking place in the fuel bed consist mainly of the gasification of the solid fuel. The  $O$  flowing up through the grate is all used as it passes through the first 3 or 4 in. of the fuel bed. The products of combustion in this part of the fuel bed are largely  $CO_2$ , and a smaller % of  $CO$ . At a height of 3 to 4 in. from the grate the  $CO_2$  content of the gases reaches a max. of 12 to 18%. As the  $CO_2$  passes through the upper layers of the fuel bed it is reduced to  $CO$ , which with the combustible gases distd. near the surface of the fuel bed constitutes 16 to 30% of the gases rising from the fuel bed. The ratio of the wt. of air that can be supplied through the grate to a lb. of coal gasified remains const. at about 7 to 1. The amt. of air supplied through the grate detd. only the rate of combustion and not its degree of completeness. For the complete combustion of 1 lb. of av. coal about 14 lbs. of air are necessary; however, as only 7 lbs. of air per lb. of coal can be supplied through the grate, another 7 lbs. must be supplied over the fuel bed in order that the gases rising from the fuel bed may be completely burned. This additional air should be

introduced close to the surface of the burning fuel and, if possible, in many fine streams. The process of combustion in the fuel bed is essentially the same whether firing is in small amts. at short intervals or in large quantities at long intervals. During the distn. period the % of combustible in the gases rising from the fuel bed is larger and more air must be supplied over the fuel bed at this stage. This requirement for a variable air supply over the fuel bed makes smokeless and economic burning of soft coal in hand-fired furnaces difficult. With the com. house-heating app. enough air to keep the fire going may leak into the ash pit when the ash-pit door is closed. Enough air to maintain combustion will not enter the fuel bed from the top surface. As the gases rising from the fuel-bed contain a large % of CO it is not advisable with hot-air furnaces to close entirely the damper in the smoke pipe, because CO may escape through defective joints into the air jacket and enter the rooms." Cf. C. A. 12, 1242.

F. W. SMITHER.

**Possibility of obtaining cheap fuel in Argentina.** CARLOS DIÁZ. *Univ. Tucumán inform. depart. investig. industri.* 1917, 35-44.—D. discusses the problem of cheap fuel in Argentina and suggests the advisability of using imported coal as raw material for building up a gas and coke by-products industry. The utilization of various by-products such as coal tar,  $C_6H_6$ ,  $NH_3$ , etc., is discussed from a technical standpoint.

H. S. PAINE.

**"Gasteam" plant at Ford City, Ontario.** ANON. *Power* 48, 186-93 (1918).—This paper describes a combination a. c. and d. c. plant employing "Gasteam" engines, the boiler feed water being used to recover waste heat from the gas engine cylinder jackets. The power units consist of a gas engine with tandem cylinders on one side of a d. c. generator, and a tandem compound Corliss engine on the other side. The exhaust from the gas engine is used to superheat the steam in the receiver which is between the high and low pressure cylinders of the steam engine. The layout of the machinery, boilers, producers, and arrangements for moving fuel to boiler furnaces and to producers are described. A new feature of the gas producer plant is the separation of the tar from the gas and its return to the producer where it is gasified with success. This method of tar disposal is more economical than the old method of burning under boilers. The gasified tar increased the heat value of the producer gas 16%, while the general gain in thermal efficiency was 8 to 9%. Exhaust steam is used to sat. the air blast to the producers, the temp. being thermostatically controlled to range between 60 and 65°. When the temp. runs below 60° there is apt to be clinker trouble, and if it exceeds 65° the production of  $CO_2$  increases. In the producer furnace fire, flame, soot, and holes up through the fire bed were avoided by having the grates inclined 35° rising from the back wall of the producer, and by specially training the firemen. The gas engines which had been previously run on natural gas containing 1000 B. t. u., took up the full load on producer gas which averaged 190 B. t. u.

L. W. RIGGS.

**The production of blue water gas in small gas works.** E. JACQUEMARD. *Het Gas* 38, 242-3 (1918).—Contrary to the prevailing opinion, it is possible for small gas plants to produce water gas at a profit. An installation is described for a capacity of 85-100 cu. m. per hr. Its initial cost is small, it can be operated by 1 man, and it yields gas which can be mixed with coal gas in as high a ratio as 40%. Thus a small plant can increase its gas production by 35-40%.

JULIAN F. SMITH.

**Physical study of the Welsbach mantle.** HERBERT E. IVES, E. F. KINGSBURY AND E. KARRER. *J. Franklin Inst.* 186, 401-38, 585-625 (1918).—Mantles of  $ThO_2$ ,  $ZrO_2$ ,  $MgO$ ,  $Al_2O_3$ ,  $SiO_2$ , and  $BeO$ , resp., were of such relatively low visible emissive power that each of these oxides by itself was useless for light-production and of no promise as a colorant. Study was also made of mantles composed of mixts. of  $ThO_2$

plus the oxide of *one* of the following metals: Ce, U, Mn, Ni, La, Pr, Ne, and Er. In all cases an optimum mixt. proportion was found; at this optimum, the luminous efficiency was greatest for Ce, followed by U and Ne, resp., and was too low in the case of the other oxides to be of much interest. "The comparatively high efficiency of both the Ce and U oxides is due to the presence of a strong absorption band in the blue end of the visible spectrum. In the case of ceria this band is present only when the oxide is hot; in the U oxide it is present also in the cold condition. Other oxides—namely, Mn and Pr—bleach when hot, thereby partly losing their visible absorption bands, with consequent low efficiency." Oxides of the following metals were not suitable for use as constituents of mantles: Ba, Cd, Ca, Fe, Mo, Sr, Ti, W, Zn, also Pt. The remainder of the paper is of interest to the physicist and the illuminating engineer.

JOSEPH S. HEPBURN.

**The use of niter cake in the manufacture of sulfate of ammonia.** P. PARRISH. *Gas J.* 143, 395-6(1918); cf. *C. A.* 11, 2728.—By adding ground niter cake to the acid charge pot, a satisfactory mixture of mixed sulfate of  $\text{NH}_4$  and Na containing a higher content than 10% of  $\text{Na}_2\text{SO}_4$  was obtained, as well as economy of working. The  $\text{H}_2\text{SO}_4$  content of the bath must not fall below 6% or else ferrocyanides may form. The free acid content of the saturator liquor should be detd. by titration. The niter cake should be added with regularity and should be of substantially uniform quality. The amount of undecomposed nitrate in the niter cake should also be known as this is the chief cause of the corrosion of the Pb. In one method the niter cake was dissolved in the feed acid in suitable Pb-lined tanks placed contiguous to the saturator at such a height that the niter-cake acid soln. flowed to the saturators by gravity. The Pb-work of the dissolving tank corroded so badly that the method was discontinued. This corrosion was due to the use of an inferior quality of niter cake or possibly the use of arsenical acid. A niter-cake soln. with an approx. content of 6%  $\text{H}_2\text{SO}_4$  can be fed to the saturator along with the acid in certain fixed proportions. The  $\text{NH}_3$  and the steam passing forward from the stills as in ordinary  $(\text{NH}_4)_2\text{SO}_4$  plants, or with the coke gas as in direct plants, enters the saturator where absorption occurs and the sp. gr. increases. After a time deposition of  $(\text{NH}_4)_2\text{SO}_4$  and  $\text{Na}_2\text{SO}_4$  occurs. Some of the saturator liquor is ejected into the mother-liquor well and the supply of acid and niter-cake soln. to the saturator is resumed until the normal level of the bath is restored. On reaching the mother-liquor well the discharged soln. cools and on reaching  $46^\circ$  practically all the  $\text{Na}_2\text{SO}_4$  crystallizes out. The lighter mother-liquor containing  $\text{NaHSO}_4$  and  $(\text{NH}_4)_2\text{HSO}_4$  is again pumped to the saturator and a definite cycle of operations established. A Mond recovery plant at Langworth, Eng., uses the following process: The gases leaving the producer after having been cooled and treated for the extn. of tar, etc., are scrubbed in a tower with a 3-4%  $\text{H}_2\text{SO}_4$  soln. On reaching the satn. point, the soln. is evapd. and treated to crystallize out the  $(\text{NH}_4)_2\text{SO}_4$ . The residual mother-liquor is concd. at about  $80^\circ$  and very little  $\text{Na}_2\text{SO}_4$  from the niter cake goes into soln. The mother liquor, containing additional  $\text{H}_2\text{SO}_4$ , with the niter-cake, is used in the tower, and the resulting  $\text{Na}_2\text{SO}_4$  sludge is washed free of  $\text{NH}_4\text{OH}$  with water, the washings being used to dil. the tower acid. By this process,  $(\text{NH}_4)_2\text{SO}_4$  with a content of 24.5%  $\text{NH}_3$  and 0.4%  $\text{H}_2\text{SO}_4$  is being produced and saleable Glaubers' salt can be crystallized out, containing only traces of  $\text{NH}_3$ , which appears to be occluded in the crystals of  $\text{Na}_2\text{SO}_4$ .

E. A. TSCHUDY.

**The composition of the light oil obtained in the benzene extraction at the Wester Gas Works in Amsterdam.** J. P. WIBAUT. *Het Gas* 38, 239-40(1918).—Analyses of light oil from benzene extns. showed the following variations of % compn.: 90%  $\text{C}_6\text{H}_6$ , 39.0 to 53.1; toluene fraction, 3.0 to 5.7; solvent naphtha, 5.1 to 12.3; tar oils, 23.2 to 33.0; loss by washing with alkali and dil. acid, 10.2 to 12.8. The rather high

% of tar oil is due to incomplete sepn. of the solvent used from the light oil. This tar oil contained large amts. of  $C_{10}H_8$ . The loss on washing consists chiefly of phenols and pyridine. The light oil contains from 1.7 to 2.4 g. of  $CS_2$  per l. J. F. SMITH.

**Determination of naphthalene in tars and tar oils.** KNUBLAUCH. *J. Gasbel.* 61, 134-7, 145-9(1918); *J. Soc. Chem. Ind.* 37, 458A(1918).—K.'s method of estg.  $C_{10}H_8$  by direct titration of the picrate with alkali (*C. A.* 11, 3198) has been adapted to the analysis of tars and tar oils. The pptn. is effected with both the sample and the picric acid in alc. soln. After mixing, the soln. is dild. with  $H_2O$ , and the pptn. is complete if the resulting soln. contains not more than 10% of alc. and at least 0.2% of picric acid or less than 12.5% of alc. and at least 0.3% of picric acid. The amt. of picric acid must be chosen to ensure these end concns. without the pptn. of free picric acid. *Crude naphthalene and tar oils:* To an amt. containing 0.1 to 0.2 g.  $C_{10}H_8$  in an erlenmeyer, add 15 cc. abs. alc. and picric acid equiv. to 2 to 2.5 times the wt. of  $C_{10}H_8$ ; heat to 60-5° until all is dissolved, cool, dil. to 120 cc. with a 0.3% aq. soln. of picric acid. Let stand 1 hr., collect the ppt. on a 10-cm. smooth filter, wash with a 0.2% picric acid soln., transfer paper and contents to a small beaker with 50-80 cc.  $H_2O$ , and titrate with 0.1 N NaOH soln., using Me-orange as indicator, and deducting 0.2 cc. for the picric acid retained by the paper and ppt. The results with pure  $C_{10}H_8$  were quant.; PhOH does not interfere. *Tar:* The amt. taken should contain about 0.07 g.  $C_{10}H_8$ , and the proportion of picric acid as above, but in no case more than 0.6 g. so as to avoid pptn. at the end. With viscous tars, weigh the sample into a small beaker and add the picric acid dissolved in 15 cc. of alc. After heating to 60-5°, carefully ext. the tar by stirring and manipulation with a glass rod for at least 30 mins. When cold, add 15 cc.  $H_2O$  and 120 cc. of 0.3% aq. picric acid soln.; leaving the tar residue in the beaker, transfer the picrate ppt. to a filter and continue the detn. as above. Tars containing much light oil and little  $C_{10}H_8$  give unsatisfactory end points, and in such cases decompose the picrate ppt. by an excess of 0.1 N NaOH soln., wash the liquid with hot  $H_2O$  into a small beaker, and filter into a conical flask. Add 5-6 cc. of a neutral soln. of an  $NH_4$  salt and det. the  $NH_3$  liberated by distn. into a measured vol. of 0.1 N  $H_2SO_4$ . When the filtration of the picrate is difficult, ext. the tar with 15 cc. of a soln. of picric acid in alc., pouring the ext. into a conical flask; make further extns. with 35 cc. of alc. and add the washings to the first, leaving the tarry residue behind. Remove 35 cc. of the alc by distn., and continue the detn. of the picrate as described. *Light oils or tar oils:* It is necessary to remove a portion of the light oil before pptn. Treat the oil taken with the picric acid dissolved in 25 cc. of alc. and distil off a portion of this; cool, add the 0.3% picric acid soln. so as to dil. the alc. 10 times, and complete the detn. by one of the methods described. The vol. of alc. distd. and the wt. of picric acid taken must be chosen so that the end concns. are appropriate.

F. W. SMITHER.

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**Determination of albuminoid nitrogen in liquids containing gas liquor (STEPHENSON) 7.**

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**Fuel-treating compositions.** J. W. EDMONDS. *Brit.* 116,252, Apr. 24, 1918. A compn. for use in treating fuel consists of NaCl,  $Na_2CO_3$ , whiting, gum acacia, and oxalic acid, with or without  $ZnSO_4$  or lamp black, or both. Suitable quantities of these ingredients are 100 lbs. of NaCl, 63 lbs.  $Na_2CO_3$ , 27 lbs. of whiting, 19 oz. of gum acacia, 15 lbs. of oxalic acid, 2 lbs. 2 oz.  $ZnSO_4$ , and lampblack sufficient to color the compn. In making the compn., the NaCl and lampblack are mixed together and dried, the  $Na_2CO_3$  is ground and mixed with the whiting, and the mixt. is dried. The 2 mixts. are mixed together, and the resulting mixt. is mixed successively with the

gum acacia,  $\text{ZnSO}_4$ , and oxalic acid. Mixed with hot  $\text{H}_2\text{O}$ , the compn. is sprinkled over the coal or other fuel.

**Filtering peat.** K. E. EDGEWORTH. Brit. 118,903, Sept. 24, 1917. Peat which has been heated to  $150^\circ$  is filtered under pressure, while hot, through unglazed porcelain or earthenware. The porcelain or earthenware is formed into cones, disks, or plates of more or less stellate section, a central passage being left for the escape of the  $\text{H}_2\text{O}$ , and the peat surrounding the filtering unit on all sides. To detach the peat from the filter, the pressure is suddenly released while the temp. is between  $105$  and  $130^\circ$ , whereupon the peat is disintegrated by the sudden production of steam.

**Carbonizing processes.** O. F. STAFFORD. Brit. 119,040, Sept. 10, 1918. Commi-nuted wood or saw dust is carbonized for the production of charcoal, etc., and of volatile by-products by means of a process in which previously dried wood is heated to a temp. appreciably above  $100^\circ$  but below  $250^\circ$ , and is then introduced into a retort which has been heated to above  $280^\circ$  but below a red heat, preferably near or above  $400^\circ$ . It is stated that the wood thus treated becomes carbonized and gives off by-products; the action is exothermic so that the process may be carried on substantially without the application of additional external heat by employing a sheet Fe or other retort provided with a thick layer of insulating material. The preheated sawdust, etc., is passed from a hopper by a conveyor to the retort opening, and the charcoal may be discharged as required through an outlet normally closed by a stopper actuated by a discharge lever. The temps. are noted by means of thermometers. An outlet for leading the vapors produced to condensers is provided. Instead of using the insulating cover, the retort may be supplied externally with a slight amt. of heat, sufficient to balance radiation losses, etc. The initial heating of the retort may be effected by burning wood in the retort.

**Destructive distillation.** BLAIR, CAMPBELL & McLEAN, J. K. ROSS and E. P. CORNER. Brit. 118,960, Dec. 13, 1917. A retort for the destructive distn. of sawdust, shavings, wood, peat, beans, nuts, and the like is constructed with a number of superposed trays formed with radial openings through which the material passes successively from the highest tray to the lowest and finally to the discharge conveyor, etc. The trays are formed with apertures through which the vapors pass, and the material on the trays is acted on by brushes, chains, rakes, etc., carried by rotating arms, these brushes, etc., being set at different heights, so that they agitate the charge as well as feed it forward to the apertures through which the charge falls to the tray below. The retort is heated by gas, etc., part of the gas produced by the retort being used if required. Alternatively, the trays may be rotated and the rotating arms fixed. Automatic feeding and discharging devices are employed, and the bottom of the retort is inclined.

**Methane.** E. E. DURT and P. C. DURT. Brit. 116,302, June 28, 1917.  $\text{CH}_4$  is prepared by heating a mixt. of C (coke, charcoal, or graphite) with a metallic hydroxide, and a catalyst, *vis.*, Ti, U, Cu, Ni, or their compds., to a high temp. Suitable metallic hydroxides are those of Na, K, Ba, Sr, Ca, Al, Fe, Mn, or Ti. The reaction of the metallic hydroxide on C yields  $\text{CO}$  or  $\text{CO}_2$  and H which, in the presence of the catalyst, react to form  $\text{CH}_4$  and  $\text{H}_2\text{O}$ , the latter reacting with more C. Cf. 29,624, 1913 (C. A. 9, 2448).

**Washing gases.** J. A. SPENCER. Brit. 116,319, Nov. 24, 1917. A gas scrubber for removing  $\text{NH}_3$ , naphthalene, and other impurities from coal gas, of the kind in which the gas is passed into contact with rotating wheels which dip into tanks and are formed of sections composed of bars or laths secured to segmental bands or metal sheets held in position by transverse bolts, is constructed with a number of rods, dowels, or tubes,

preferably arranged so as to break joint, secured between segmental plates on boards formed with apertures for receiving the rods, and attached in a contiguous manner by means of bolts and nuts to similar plates which are secured together by transverse bolts and nuts. The plates last mentioned are secured to the rotating wheel by transverse bolts which pass through slots in the plates.

**Coking processes.** H. K. HILLER. Brit. 118,522, Nov. 20, 1917. A gas suitable for use in containers or motor vehicles, etc., and consisting mainly of  $\text{CH}_4$ , is obtained by distg. at a temp. not exceeding  $500^\circ$ , bastard cannel coal, lignite, wood, peat, shale, etc., in an horizontal or vertical retort, through which the material is continuously fed in a thin layer or column by means of a screw conveyor or the like. Cracking or dissociation of the gaseous products is prevented by introducing into the retort part of the gas which is the result of the process and which is compressed to a pressure of at least 15 atm. and allowed to expand into the retort to cool and carry away the gaseous products produced. These are then passed through condensers for extg. liquid hydrocarbons, and other hydrocarbons are extd. by passage through washing oils. The gas is then compressed by a water-cooled pump to a pressure of 15 atm., whereby a *spirit similar to gasoline* is formed, and a stable gas is left which is mainly  $\text{CH}_4$ , part of the gas being used to carry out the process described above.

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## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

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F. M. ROGERS.

Coking processes (motor fuel) (Brit. pat. 118,522) 21. Purifying oils (Brit. pat. 118,353) 27.

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**Cracking hydrocarbons.** S. MAXIM and A. W. CROSSE. Brit. 118,122, Aug. 18, 1916. Heavy hydrocarbons, such as kerosene, are converted into lighter hydrocarbons by subjecting them while under pressure and at a high temp. to agitation and electrochem. action. A suitable app. is specified.

**Cracking hydrocarbon oils.** J. NELSON. Brit. 116,304, Mar. 13, 1917. Hydrocarbon oils and the like are cracked by passing the hydrocarbon or its vapors through an agitated liquid contact material such as molten Pb, the agitation of the liquid being effected preferably by the passage of the hydrocarbon vapors and gases through it. If the hydrocarbons to be cracked contain tarry or other non-volatile matters, they may be distd. from an auxiliary vessel and the distillate or vapors subjected to the cracking process. The whole or part of the product may be subjected to one or more re-treatments. The app. may consist of one or more vertical cylinders set in a furnace and each contg. a quantity of molten Pb in which is immersed the lower end of a vertically adjustable oil-inlet pipe, the products passing out through a lateral pipe. Modifications are specified.

**Refining oils.** H. G. C. FAIRWEATHER. Brit. 116,418, Sept. 4, 1917. In a process of refining lubricating oils to produce paraffinum liquidum, the oils, after treatment with acid and the removal of the sludge formed thereby, are mixed with  $\text{NH}_3$  and alc. and the mass is allowed to settle. In one example of the process,  $\text{H}_2\text{SO}_4$  is added, in successive instalments of increasing strength, to an approx. equal wt. of oil, the sludge being removed after each treatment. A soln. contg. 1 vol. of strong  $\text{NH}_4\text{OH}$  to 2 vols. of strong alc. is then added, and the resulting product, after settling, is dried by passing a current of hot air through it or otherwise, and is filtered through a column of fuller's earth.



## 23. CELLULOSE AND PAPER.

A. D. LITTLE.

**Cellulose articles.** C. F. CROSS and VISCOSE DEVELOPMENT CO. Brit. 116,366, June 12, 1917. In the manuf. of coverings or masses from amorphous cellulose regenerated from the xanthate, the covering or mass is subjected to a progressively increasing continuous or intermittent rolling pressure during drying. The method may be applied to the covering of shafts, spindles, rollers, or wheels with a layer of cellulose. A tube or annulus of the hydrated regenerated cellulose is formed, cut up into suitable rings, etc., washed, and placed on the roller, etc., to be covered; the shrinkage which occurs on drying fixes the covering on, and gradually increasing rolling pressure is then applied during the subsequent drying; the drying may be accelerated by heating the rolling surfaces or by a current of hot air. Glycerol or other material may be incorporated with the cellulose at a suitable stage in the process. Rollers made or coated with cellulose in this way may be engraved and used for printing purposes. According to the provisional specification, "top rollers" of cotton-spinning machines may be made in this way. Cf. 2,880, 1905.

**Wood cellulose, etc.** AKTIEBOLAGET CELLULOSA. Brit. 116,288, May 27, 1918. In obtaining cellulose by boiling raw material such as wood with NaOH lye, the lye is subjected during the boiling to a "contact substance" having a reducing action, such as Hg. The boiler is given a thin coating of Hg once every 14 days, by filling it with 0.001 normal  $\text{HgCl}_2$  soln. The lye used, which must be free from S, contains about 60 g. of  $\text{Na}_2\text{O}$  per liter and its strength is maintained by adding lye during the boiling operation. The temp. is  $140-70^\circ$  and additional pressure may be obtained by means of compressed air. The lye may be obtained by dissolving soda from the dry distn. of waste liquor in the waste lye from a previous boiling after it has been freed from lignin by  $\text{CO}_2$ . Air may be removed from the material to be treated by drenching it with  $\text{H}_2\text{O}$  or by exhausting the boiler before admitting the lye. The used lye may be regenerated by the process described in 6,652, 1912 (C. A. 7, 3025).

**Non-inflammable celluloid.** H. DREYFUS. Brit. 118,891, Sept. 14, 1917. In the manuf. of non-inflammable celluloid, including, in particular, those having a basis of acetate of cellulose, the pressure to which the celluloid is subjected for some hrs. to complete the production is about 300 kg. per sq. cm. or upwards.

**Celluloid-like material from vegetable proteins.** S. SAROW. U. S. 1,280,862, Oct. 8. Vegetable proteins such as those from peas, beans, wheat or corn are partially hydrolyzed (*e. g.*, by the action of steam, dil. acids or alkalies, enzymes,  $\text{SO}_2$  or alc.) and a mixt. for making molded articles is then prep'd. from this partially hydrolyzed material by combining it with glutinizing and condensing agents such as tannin,  $(\text{CH}_3)_3\text{N}_4$ , trioxymethylene, aldehydes, NaOH, sulfides, borates, silicates, carbonates, phosphates, sulfites, formates or acetates of alkali metals or of  $\text{NH}_4$ , or with  $\text{H}_3\text{PO}_4$  or other inorganic acids, organic acids, phenol, nitroresol or other modifying ingredients.

**Plastic material containing ethyl cellulose ether.** P. C. SEEL. U. S. 1,281,080, Oct. 8. A mixt. suitable for making smooth, flexible, transparent films, or for forming molded articles, is made from ethyl cellulose ether 50-100, combined with chlorinated naphthalene derivs. 10-20,  $\text{CHCl}_3$  200-400 and denatured alc. 150-250 parts. Amyl acetate and chlorinated anthracene derivs. also may be used in similar compns. The products are resistant to photographic chemicals and are suitable for the manuf. of motion picture films.

**Cellulose acetate.** H. DREYFUS. U. S. 1,280,974, Oct. 8. An acetylizing mixt. is formed of  $\text{Ac}_2\text{O}$  300, glacial HOAc 400 and  $\text{H}_2\text{SO}_4$  15-18 parts and there is then

added to this mixt. sufficient  $\text{Na}_2\text{CO}_3$  or  $\text{NaOAc}$  to convert most but not all of the  $\text{H}_2\text{SO}_4$  into bisulfate. Cellulose containing 3-6%  $\text{H}_2\text{O}$  is then treated with the soln. thus formed and afterward the cellulose acetate produced is subjected to the action of the acetylizing soln. after 5-50% of  $\text{H}_2\text{O}$  has been added, until a product is obtained which is insol. in  $\text{CHCl}_3$  alone but sol. in  $\text{CHCl}_3$  mixed with alc. and somewhat sol. in acetone. U. S., 1,280,975 relates to making a cellulose acetate insol. in  $\text{CHCl}_3$  and also insol. in  $\text{CHCl}_3$ -alc. mixt., by reacting on cellulose with a mixt. of  $\text{Ac}_2\text{O}$  300, glacial  $\text{HOAc}$  400 and  $\text{H}_2\text{SO}_4$  15-18 parts. Before the soln. is used, it is cooled to below  $0^\circ$  and during the acetylation the temp. is maintained below  $25^\circ$  until after a product is formed having the desired solubilities.  $\text{H}_2\text{O}$  may be added to the reaction products, to change the solubilities of the acetate formed.

**Viscose.** B. BORZYKOWSKI. Brit. 116,268, Apr. 15, 1918. Threads and other articles are prep'd. from viscose soln. in a fresh or only slightly matured and unpurified condition. As pptg. baths, dil. acids (contg., *e. g.*, less than 5%  $\text{H}_2\text{SO}_4$ ) or strong salt solns. of d. greater than  $18^\circ \text{Bé.}$  may be used and the threads are given an extended travel (at least 10 cm.) through the bath. Acids, up to 10% of  $\text{H}_2\text{SO}_4$  or acid salts such as  $\text{Al}_2(\text{SO}_4)_3$  may be added to the salt solns. Alcs., metallic salts, or organic substances such as the nitroso bases referred to in U. S. 1,143,569 (*C. A.* 9, 2315) for preventing deposition of S on the threads, may be added to the pptg. baths. In examples, clear threads are formed by pptg. in a 2.5-3%  $\text{H}_2\text{SO}_4$  bath, with a distance for pptn. of 25-30 cm. and a take-up speed of 40 m. per min., and artificial silk is made by pptg. in a soln. of Na and  $\text{NH}_4$  sulfates of a d. of at least  $22^\circ \text{Bé.}$ , contg. 2-3% of  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$ , and at a temp. of  $35\text{-}50^\circ$ .

**Drying paper.** E. PARTINGTON DOVERDALE. Brit. 118,511, Nov. 3, 1917. In drying paper in a paper machine, a proportion of the drying cylinders over which the paper first passes is heated to, and maintained at, a temp. higher than the temp. of the remaining cylinders, which may be maintained at a const. lower temp. or at a progressively decreasing temp. In an example, where 16 drying cylinders are used, the first 5 are heated to  $200^\circ \text{F.}$ , and thereafter there is a successive fall of  $10^\circ \text{F.}$  per cylinder.

**Paper tubes.** F. WOOLFENDEN. Brit. 118,169, Sept. 12, 1917. In the manuf. of paper tubes or bobbins, such as are used in textile industries, the paper is coated with glue while being wound, and the tube so produced is similarly coated, and then subjected to the action of  $\text{HCHO}$  soln. or vapor and dried at a temp. of  $220^\circ \text{F.}$

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## 24. EXPLOSIVES AND EXPLOSIONS.

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C. E. MUNROE.

**Methods for routine work in the explosives physical laboratory of the Bureau of Mines.** S. P. HOWELL AND J. E. TIFFANY. Bur. Mines, *Tech. Paper* 186, 63 pp. (1918).—States character of materials tested; the organization of the section for the work, with the duties of each person; the precautions to be observed in storing, handling and testing; the quantities required; the methods of receiving, identifying and recording samples sent and of recording the results of the tests; detailed descriptions of the methods of making the several tests and computing the results. There are appended 15 tables for use in the computations, many of which have been constructed at the Pittsburgh Testing Station.

CHARLES E. MUNROE.

**The determination in cotton for nitration of the matter which is insoluble in sulfuric acid.** ED. JUSTIN-MUELLER. *l'Ind. chim.* 5, 218-20(1918).—Cellulose is practically completely sol. in properly dild.  $\text{H}_2\text{SO}_4$  or ammoniacal  $\text{CuO}$  while the non-cellulosic

matter present, and particularly the cuticle, or epidermis, is not dissolved but is carbonized and remains with the insol. mineral compds. which are detd. as "ash." These consist largely of  $\text{Ca}_3(\text{PO}_4)_2$  and  $\text{CaCO}_3$  and an error may creep into this detn. through the action of the  $\text{H}_2\text{SO}_4$  converting them into sulfates, for, as shown, these mineral compds., which amount to 25% of the wt. of insolubles in a cotton of good quality, are increased to 32.59% by the  $\text{H}_2\text{SO}_4$  treatment. Mueller describes the method of calcn. to be followed through which to avoid this error. CHARLES E. MUNROE.

Apparatus for drowning, washing and conveying nitro-cellulose. J. D. ELACK. U. S. 1,280,981, Oct. 8.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Analysis of logwood extracts. G. SAVINI. Rome. *Ann. chim. applicata* 10, 26-32(1917).—Present war conditions have given increased value to vegetable coloring exts., among which the principal one is logwood ext. Its analysis comprizes detns. of  $\text{H}_2\text{O}$ , ash, coloring and non-coloring substances, insol. substances, and tinctorial power. It must also be examnd. for presence of adulterants, *e. g.*, glue, dextrin, tanning exts., molasses, etc. Molasses is chiefly used as adulterant. For detn. of  $\text{H}_2\text{O}$ , take 5 g. of the material, dry in an oven for 6 hrs. at  $105^\circ$  in a Pt dish of 10 cm. diam. For detn. of ash use the residue from the  $\text{H}_2\text{O}$  detn. To avoid the enormous swelling that usually accompanies the beginning of carbonization, S. recommends the following: Put the dish with residue from  $\text{H}_2\text{O}$  detn. in the oven for 1 hr. at  $105^\circ$ , then gradually raise the temp. to  $170-80^\circ$ , after which carbonize directly over the flame. Introduce the dish into the muffle, regulating the temp. so as to avoid fusion of the ash, especially with exts. adulterated with molasses. The detn. of the sugars offers some difficulty because the solns. obtained through the use of basic Pb acetate in defecation, and also Na sulfate and phosphate, assume rapidly in the light a more or less intense blue color that renders the reading of the saccharimeter impossible. S. recommends the following method: Dissolve 40 g. of the fluid ext. or 20 g. of dry ext. in about 100 cc. boiling  $\text{H}_2\text{O}$ . Pour the whole into a tared flask of 200-300 cc. Add to the hot liquid while agitating, not less than 50 cc. Pb acetate. Cool rapidly, bring to vol. of 200 cc. then add 15-20 cc.  $\text{H}_2\text{O}$  to allow for the vol. of insol. substances (20 cc. for exts. containing less than 10% sugar, 15 cc. for exts. containing over 10% sugar). Shake, filter rapidly, pour 100 cc. of the filtrate into a 150-cc. flask, add a concd. soln. of Na sulfate and phosphate to complete pptn. of Pb. Bring to vol. and filter. The liquid thus obtained is treated in the ordinary manner, inverting a part and detg. the sucrose by Clerget's method, and finally the reducing sugars by the chem. method. In this manner there are obtained limpid and colorless liquids which remain so for a considerable time, and the detns. are exact. Defecation with hydrated Fe oxide proposed by Cochenhausen is not practically possible for saccharimetric detns. The presence of molasses may be indicated from some physico-organic character. If a little of the ext. is heated in a dish with boiling  $\text{H}_2\text{O}$ , the characteristic odor of molasses may be perceived in presence of the latter in amounts even as small as 5%. In dry exts. the presence of considerable quantities of molasses causes a change of color and a pitchy consistency. Pure exts. have a decidedly reddish brown color, are friable and do not soften except at high temps. Exts. containing much molasses take on a clear brown color and soften even between the fingers; in time, even at ordinary temps., especially in warm weather, they become fluid and take the shape of the containing vessel. According to Cochenhausen the brown color of the ash of the ext. often indicates the presence of molasses.

S. found, however, that with exts. containing as high as 20% molasses, the ash was fairly white. A good indication of the presence of molasses is furnished by the easy fusibility of the ash of exts. containing it, on account of their high content in K salts. The above crude tests are qual. only. S. worked out a method of detg. molasses, based on the fact of the small amount of  $K_2CO_3$  in logwood ext.: the ash amounts to about 2%, of which  $\frac{1}{4}$  is  $K_2CO_3$ . The method is as follows: Lixivate with boiling  $H_2O$  the ash obtained in detn. of mineral substances. Filter through a small filter, wash the dish and filter well so as to use not more than 100 cc., cool, titrate with 0.1 N  $H_2SO_4$ , using Me orange as indicator. Express the results as cc. 0.1 N alk. per 100 g. dry ext., which from may be calcd. the corresponding amount of  $K_2CO_3$ . The method gives satisfactory results. In only 1 sample of fluid ext. was there wide divergence between volumetric and gravimetric figures; this was due to adulteration with tanning ext., and consequent presence of much  $H_2SO_4$ . Taking 0.4-0.5% as being the amount of  $K_2CO_3$  in pure logwood ext., and 6-7% as that of molasses, the estn. of the amount of the latter in logwood ext. may be made. This estn. should be checked by the amount of sucrose found, assuming that molasses contains an average of 50% sucrose. If a certain quantity of sucrose is found in a sample of ext. and the amount of  $K_2CO_3$  is equal to that of the pure ext., then it is evident that sugar has been added as such (may be raw sugar), and molasses is not present. Analyses of 14 different samples of dry and liquid com. logwood exts. are given.

ROBERT S. POSMONTIER.

**Present position and future prospects of the natural indigo industry.** W. A. DAVIS. *Agr. J. India* 13, 441-59(1918); cf. *C. A.* 12, 1125, 2444.—One of a series of papers dealing with the improvements of the agricultural production of indigo. If the yield of green plants can be brought up to 4.5 tons per acre it is shown that the natural dye should be able to compete favorably with the synthetic article. The production of indigo grown in soils without fertilization has decreased from year to year. The production has been increased by phosphate fertilization. The soils have undergone considerable deterioration as regards the amount of  $P_2O_5$  present during the last 20 years. The wilt of the indigo plant is held to be caused by a lack of P in the soil. The first symptom of deterioration in the soil is the gradual failure of seed yield, which is said to be the first indication of phosphate starvation. The amt. of indigo in the plant has decreased with the yield. Phosphate fertilization is urged upon the growers.

J. J. SKINNER.

**Black dyes. I. Natural coloring matters.** CHAS. S. WEHRLY. *Color Trade J.* 2, 118-20(1918).—General discussion of logwood, its chem. compn., methods of dyeing, properties, and economic consideration. **II. Black sulfide dyes.** *Ibid* 154-6.—A general discussion of their compn., use, application and methods of detecting on the fiber. **III. Chrome blacks.** *Ibid* 189-92.—General discussion of their constitution, preparation, uses and application. **IV. Developed colors.** *Ibid* 208-12.—A general discussion of their constitution, prepn., uses and application. The various developers used are also discussed in some detail.

L. A. OLNEY.

**Hematoxylon africanum.** A. G. PERKIN. *J. Soc. Dyers Colourists* 34, 99(1918).—Hitherto the genus *Hematoxylon* has been represented only by the *H. campeachianum*, but another species termed the *H. africanum* has been recently discovered in So. Africa. *H. africanum* differs from logwood in that the coloring matter it contains is not hematoxylon but a substance which resembles brazilin in its general properties. It is not as good a dye as brazilin and is of no technical importance.

L. A. OLNEY.

**Intermediate products and dyes.** J. C. CAIN. *J. Soc. Dyers Colourists* 34, 200-1(1918); *British Sci. Products Exhibition Catalogue* p. 11.—At the outbreak of the war it was discovered that the apparently wide range of dyes made in England had been

produced largely from intermediates made in Germany. Fortunately England was a great producer of the raw materials, and although handicapped by the necessity of diverting chemical resources to the production of munitions she has risen to the occasion, and is today producing the intermediates necessary for the manuf. of most of the essential dyes. It will, however, be some time before the wide range of colors covered by the Germans will be manufd. L. A. OLNEY.

**British dye industry.** M. O. FOSTER. *J. Soc. Dyers Colourists* 34, 201(1918).—In discussing the decay and renaissance of British dye making, F. points out that great effort will be needed to overtake Germany. It can only be achieved if money is spent on experimental work. L. A. OLNEY.

**Dyes and intermediate products.** SOCIÉTÉ L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). *Brit.* 118,103, July 22, 1918. 4'-*p*-Hydroxyphenylamino-2-amino-4,5-dichlorodiphenylamine is prepd. by condensing 1-nitro-2,4,5-trichlorobenzene with aniline in the presence of NaOAc, condensing the resulting dichloronitrodiphenylamine with *p*-nitrosophenol in H<sub>2</sub>SO<sub>4</sub> soln., and reducing the product. A dye, giving navy blue shades on cotton in alkali sulfide or hyposulfite baths, is obtained by heating 4'-*p*-hydroxyphenylamino-2-amino-4,5-dichlorodiphenylamine with S or a polysulfide, alone or in the presence of a solvent such as glycerol, bases, phenols, etc.

**Dyes; intermediate products.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. *Brit.* 118,448, Aug. 28, 1917. Pyrazolone-azo dyes are obtained (1) by coupling the diazo compds. of anthranilic acid or its substitution products (except those contg. OH in *o*-position to the NH<sub>2</sub> group) with pyrazolones of the benzene or naphthalene series contg. an OH group in the aryl residue and derived from acetoacetic ester, or (2) by coupling the diazo compds. of amines (not contg. OH or COOH in *o*-position to the amino group) with pyrazolones derived from acetoacetic ester and contg. an OH and a COOH group in the aryl residue. Examples are given. The pyrazolones mentioned above are made from the corresponding hydrazines and acetoacetic ester. Cf. 3,373, 1908, 13,843, 1914 (*C. A.* 9, 3367), 12,250, 1915 (*C. A.* 11, 302), and 13,204, 1915 (*C. A.* 11, 542).

**Dyes; pigments.** W. A. ALLSEBROOK. *Brit.* 118,735, Nov. 7, 1918. A sol. coloring matter similar to Vandyke brown is prepd. by grinding powdered waste leather with a warm strong soln. of caustic alkali until the product is dry and water-sol.; if the waste leather contains cellulose as impurity, a small amt. of an alk. oxidizing agent is added to the mass, *e. g.*, NaOCl or Na<sub>2</sub>O<sub>2</sub>. Insol. pigments are obtained by grinding an aq. soln. of the color with Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> soln. and a substratum such as SiO<sub>2</sub>, washing the product, and drying, or by grinding the soln. with CaSO<sub>4</sub>.

**Dyeing.** IMPERIAL TRUST FOR THE ENCOURAGEMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH and G. G. HEPBURN. *Brit.* 116,360, Jan. 11, 1917. Solns. which probably contain the diazo oxides RN<sub>2</sub>OC<sub>10</sub>H<sub>6</sub>SO<sub>3</sub>Na are obtained by treating with caustic alkalies or with salts of alk. reaction the diazosulfonates prepd. from diazo salts and 2-naphthol-1-sulfonates as described in 11,757, 1895. Insol. azo dyes are prepd. on the fiber by padding or printing with a soln. (suitably thickened if necessary) of the diazo oxides described above, and developing by ageing or by passing through an acid bath, or by exposure to an acid atm., *e. g.*, one contg. HOAc or HCCOOH. Or the diazo oxide soln. may be printed on material which has been prepd. with a salt of acid reaction or an org. acid, *e. g.*, Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>, tartaric or citric acid, and then dried. Examples are given of the production of *p*-nitroaniline red. The diazo or tetrazo compds. derived from  $\alpha$ -naphthylamine, nitro-*o*-toluidine, nitro-*o*-anisidine, benzidine, tolidine, and dianisidine also are mentioned as parent materials.

**Azo dye.** E. F. EHRHARDT and H. W. EHRHARDT. U. S. 1,281,243, Oct. 8. An azo dye is produced by combining diazotized picramic acid with the effluent from the fractional combination of diazotized picramic acid with a mixt. of cresols, stirring until combination is complete, then filtering and stirring with sufficient  $H_2O$  to form a paste. The dye so obtained dyes unmordanted wool from an acid bath chocolate-brown shades and dyes wool mordanted with Cr compds. olive-brown shades fast to scouring, milling and light.

**Dyes of the anthracene series.** R. BOHN. U. S. 1,280,648, Oct. 8. Dyes are produced by reacting upon an aromatic amine with an anthraquinone- $\beta$ -arylide, which may be substituted in the anthraquinone residue or in the arylamine residue or in both, in the presence of a caustic alkali or alkali metal alcoholate, and preferably also in the presence of an oxidizing agent. In some instances, the process of producing the dye and the production of the anthraquinone- $\beta$ -arylide can be effected in a single operation by heating the compds. which form  $\beta$ -arylinoanthraquinone (e. g., an anthraquinone- $\beta$ -sulfonic acid or a deriv. thereof and an aromatic amino compd., or a  $\beta$ -haloanthraquinone and an aromatic amine) in the presence of strong alkali and, preferably, in the presence of an oxidizing agent. Examples are given in which the dyes are formed: (a) by heating aniline, KOH and  $\beta$ -anilinoanthraquinone to  $180^\circ$ , blowing air through the mixt. and purifying the product by further blowing with air after addition of  $H_2O$ , followed by treatment with HCl to remove excess aniline, (b) by heating anhydrous aniline, NaOH, KOH and Na anthraquinone-2-sulfonate at  $180^\circ$  for 8 hrs. while passing air through the mixt., and purifying by extg. with a dil. alkali and with cold acetone. ( $\beta$ -Chloroanthraquinone may replace the sulfonate as starting material in this process, in which case a Cu compd. is preferably added to promote the reaction); (c) by treating the condensation product formed from  $\beta$ -anilinoanthraquinone and aniline with fuming  $H_2SO_4$  containing 23% of free  $SO_3$ , stirring for 22 hrs. at a temp. of  $80^\circ$ , then pouring the melt into cold  $H_2O$ , treating it for a short time with a soln. of  $FeSO_4$  and then pptg. the dye formed, by the addition of NaCl; (d) by treating the condensation product formed as described under "a" or "b" with  $H_3BO_3$  free from  $H_2O$ , and heating this mixt. with fuming  $H_2SO_4$  (containing 23% free  $SO_3$ ) for about 50 hrs. at  $90^\circ$ . The dyes formed are greenish or bluish powders. If unsulfonated, they are insol. in  $H_2O$ , aqueous acids and alkalis and sol. in org. solvents, but if they are combined with at least one  $HSO_3$  group they are sol. in  $H_2O$ , aq. acids and alkalis and in alc. and acetone. The unsulfonated dyes can be used in the production of colored varnishes containing oil or alc. The sulfonated dyes dye wool fast greenish or bluish shades.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**Injurious substitutes for turpentine in the painting trade.** ANON. *Am. J. Pub. Health* 8, 736.—"All paint of low b. p. distd. products of petroleum, light coal tar, turpentine,  $CS_2$ , or similar substances, shall be considered as injurious to health."

M. K. BIXBY.

**The Chinese wood oil tree.** E. N. WARD. *Agr. Gaz. N. S. Wales* 29, Pt. 6, 437 (1918).—An article calling attention to the ease with which this valuable tree can be induced to grow in N. S. Wales. The oil obtained from it is a valuable substitute for linseed oil. The seed contains about 58% of the oil.

R. B. DEEMER.

**The present condition of lac cultivation in the plains of India.** C. S. MISRA. *Agr. J. India* 13, 405-15 (1918).—Lac is a resinous secretion produced by a scale insect which sucks the juice of plants. In India the lac insect flourishes best on the *Acacia*

*arabica*: most of the supply is obtained from this source. From 1905 to 1916 over 450 million lbs. of shellac made from insect excretion was exported from Calcutta.

J. J. SKINNER.

**Constituents of resins. I. Siarsesinol from Siamese gum benzoin.** ALOIS ZINKE AND HANS LIEB. *Monatsh.* 39, 95-105 (1918); *J. Chem. Soc.* 114, I, 398-9.—Siarsesinol from Siamese gum benzoin is probably identical with the benzoresinol obtained by Ludy from the same source; it gives an *addition compound* with *acetic acid*,  $C_{30}H_{48}O_4 \cdot C_2H_4O_2$ , needles, m. 280-1.5°, and a *benzoyl derivative*, needles, m. 182-3°,  $[\alpha]_D^{20}$  30.0° (EtOH), which on hydrolysis regenerates siarsesinol. C. J. WEST.

**Estimation of cobalt (JONES) 7.** Washing coal, ores, etc. (Brit. pat. 119,038) 18. Titanium products; pigments (Brit. pat. 116,266) 18.

**Theatrical grease paints.** E. W. WILLCOCKS. Brit. 118,435, Aug. 24, 1917. Grease paints consist of a mixt. of a fatty base, such as hard and soft white paraffins, with a pigment prepd. by treating an insol. white powder with a soln. of a coloring matter which is insol. in the fatty base and then drying and repowdering the product. Specified insol. powders are starch, chalk, kaolin, ZnO, and mixts. thereof. Specified aniline dyes for use as the coloring matter are victoria scarlet, methylene blue, and auramine. Various tints may be prepd. by mixing the dye solns. or the dyed powders, with or without the addition of a black dye or powder. The proportion of dye to white powder may be varied but the proportion of the powder to the fatty base is standardized.

**Oil pastes.** C. R. ROGERS. Brit. 118,289, Aug. 14, 1918. Pptd. pigments such as white lead are ground up with oil without drying them. When the ppt. and oil are well mixed, a small quantity of borax or other weakly alk. salt is sprinkled on the mass and the milling is continued. The H<sub>2</sub>O contained in the moist ppt. seps. from the paste and is poured off.

**Fatty acids of linseed oil.** BARRY, OSTLER & SHEPHERD and J. BARRY. Brit. 118,228, Feb. 5, 1918. Linseed oil fatty acids are rendered suitable for use in the *linoleum, floor cloth, paint, color, etc.*, industries by treatment with superheated steam. Steam of about 400° is blown through the fatty acids in a steam-jacketed pan for about 18 hrs. By this means, metallic compds. are broken up, deleterious volatile substances are driven off, and the fatty acids are rendered more easily oxidizable. The product may be "smacked" or otherwise treated in the same manner as linseed oil for the manuf. of linoleum, etc.; a higher temp. than usual may be employed.

**Enamelled metal articles.** K. WARGE. Brit. 116,361, June 11, 1917. A vitreous enamel is applied to a sheet of Al or Al-contg. metal and the article is subsequently shaped from the enameled sheet by bending, stamping, etc. Suitable enamels consist of mixts. of SiO<sub>2</sub>, Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>, and red lead, or SiO<sub>2</sub>, red lead, and oxide of Bi. The enamel may be applied mixed with varnish, etc., or may be sprinkled upon a varnish layer or upon the heated material. Pigments may be added and filling such as metal or metal salts may be mingled with the enamel.

**Waterproofing fibrous materials.** P. F. BOVARD. U. S. 1,280,954, Oct. 8. Animal, vegetable or mineral fibrous material to be waterproofed is immersed in a saponified linseed oil and casein bath until the fibers are thoroughly satd., removed from the soln. and squeezed to remove excess soln., then treated with a soln. of Al acetate or other Al compd., and dried.

**Composition for removing paint.** L. HABER. U. S. 1,281,156, Oct. 8. A mixt. for removing paint is formed of paraffin 8, alc. 14, H<sub>2</sub>O 20, sal-soda 30 and C<sub>6</sub>H<sub>6</sub> 28 parts.

**Plastic mixtures of phenolic condensation products and solvents.** J. W. AYLSWORTH. U. S. reissue 14,530-1, Oct. 8. See original pat. 1,087,422, C. A. 8, 1354.

**Paints; varnishes.** F. W. SPERR and M. DARRIN. Brit. 118,079, Dec. 14, 1917. A paint or varnish comprizes a bituminous pitch, a volatile solvent such as solvent naphtha, and compds. or polymerization products of the coumarone-indene group (coumarone, indene, mono-, di-, or trimethylcoumarones, hydrindene, dicyclopentadiene, or styrolene). The coumarone-indene compd. may be dissolved in the solvent and added to the molten pitch. When polymerization products are used, the step of polymerizing may occur previously to, simultaneously with, or subsequently to the step of mixing the pitch and the soln. The coumarone-indene compd. in the mixt. may be polymerized by blowing through air or steam, or by the use of a catalyzer such as  $\text{AlCl}_3$ . Other materials, such as turpentine, linseed oil, Chinese wood oil, Venetian red, red lead, Zn oleate, Mn resinate, or  $\text{BaSO}_4$  may be added for use as thinners, driers, fillers, etc.

**Varnish from vegetable proteins.** S. SAROW. U. S. 1,280,861, Oct. 8. A varnish which contains  $\text{H}_2\text{O}$  as principal solvent and which does not change the natural color of wood to which it is applied is formed from proteins such as those obtained from beans, peas, wheat or corn mixed with a "glutinizing agent" and preferably also with a small amt. of a disinfectant such as phenol, creosote or salicylic acid and a dil. soln. of  $\text{CH}_2\text{O}$  in such small amt. as not to have any active condensing action. Among the glutinizing agents which may be used are:  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{K}_2\text{CO}_3$ ,  $(\text{NH}_4)_2\text{CO}_3$ ,  $\text{Ca}(\text{OH})_2$ , borax, Na phosphate, urea, pyridine, glycine, formic, acetic, propionic, phenylpropionic, malonic, lactic, tartaric and malic acids, phenol, salicylic, benzoic, phosphoric and sulfurous acids. The varnish dries to a hard film which can be polished. It may be combined with pigments if desired.

## 27. FATS, FATTY OILS AND SOAPS.

R. SCHERUBEL.

**Fatty oils of *Sambucus racemosa*, L. II.** J. ZELNER. *Monatsh.* 39, 87-94 (1918); *J. Soc. Chem. Ind.* 37, 519A.—The European elder, *Sambucus racemosa* L. and the N. A. *Sambucus racemosa*, var. *arborescens*, although very similar, exhibit distinct but slight differences in nature. This probably accounts for the difference between the characteristics of the oil from the flesh of the red berries of these varieties. The oil from the former when kept for 15 years in a stoppered flask undergoes marked alteration with increase in the proportions of free acid and decrease in the I value. The elder seeds also yield an oil, sp. gr. 0.934 at  $15^\circ$ ,  $[\alpha]_D^{20}$  1.485, sapon. no. 190.8, and I value (Hübl) 162.0; in its drying properties and other characteristics this oil resembles linseed oil.

C. J. WEST.

Table of the more important tests and properties of official fats and oils (FLEISSIG)  
17.

**Recovering fats.** NATIONAL SANITARY SERVICE CO. Brit. 116,384, July 3, 1917. Fat is recovered from waste liquids, such as slaughter-house refuse liquid, by first pptg. the heavy sediment and then passing the liquid thus freed through a tank of known construction wherein a relatively large still body of liquid is maintained above an underlying accelerating current of the same, the fat sepg. in the still area and the waste being drawn off below.

**Recovering fats from waste water.** G. G. JARMAN. Brit. 118,332, Aug. 25, 1917. In a process of sepg. by a centrifugal machine grease from  $\text{H}_2\text{O}$  in which wool



has been washed, the  $H_2O$ , preferably heated nearly to boiling, is passed through a centrifugal filtering device to sep. the sand and like impurities, and then through a bowl centrifugal to sep. the grease from the  $H_2O$ . A suitable app. is specified.

**Purifying oils.** SWAN PROCESS OIL CO. Brit. 118,353, Sept. 25, 1917. In a process of refining oils, applicable, *e. g.*, for reclaiming waste lubricating oils, the oil is treated with kieselguhr or like diatomaceous earth and subsequently filtered. The oil so purified may be distd. to remove volatile impurities and thereafter again treated with the kieselguhr, etc., and filtered. A suitable plant is specified.

**Extracting oil, wax resins, etc.** J. MACGREGOR. Brit. 118,461, Aug. 30, 1917. In extg. oil, wax, resins, etc., from bone charcoal, fuller's earth, etc., the substance to be treated is made into a paste or emulsion with  $H_2O$  previous to treatment with a solvent, which, with the substance to be extd. in soln., is removed by decantation, the solvents used being lighter than  $H_2O$ . The provisional specification states that the  $H_2O$  may be mixed with the solvent instead of the substance to be treated.

**Catalysts for hydrogenating oils.** K. KIMURA. Brit. 118,323, Aug. 22, 1917. A catalyst for use in hydrogenating oils is prepd. by passing  $NH_3$  or a volatilized  $NH_4$  salt over a heated mixt. of a powdered Ni salt and a non-catalytic incombustible substance such as powdered asbestos, infusorial earth, or pumice. A Ni salt such as the nitrate, sulfate, chloride, formate, acetate, or oxalate is heated to about  $400^\circ$  after intimate mixt. with powdered inert material, in a vessel of non-catalytic substance and  $NH_3$  or preferably  $NH_4Cl$  gas is led in while the material is stirred by an agitator. The prepd. Ni is agitated with the oil in an atm. of H in a machine such as is described in 113,232 (C. A. 12, 1423).

**Detergent.** A. W. FOREE. U. S. 1,280,698, Oct. 8. A material for cleaning textile fabrics is formed of rounded sand 5.75 lbs., fullers' earth 12 oz., NaCl 3 oz., soap 2 lbs., borax 3 oz. and  $NaNO_3$  1 oz. and absorbed ammonia, molded into the form of a solid block.

**Liquid detergent.** R. HUBBARD. U. S. 1,281,010, Oct. 8. A liquid mixt. suitable for cleansing painted and varnished surfaces is formed of soap 3,  $H_2O$  83.5, powdered pumice 5.5 and neutral petroleum oil 8 parts. The oil serves to hold the pumice in suspension in the liquid.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

**Valuation of raw sugars.** W. D. HORNE. *J. Ind. Eng. Chem.* 10, 809-12 (1918).

-The existing custom of purchasing raw sugars on their polarization alone is far from satisfactory because it does not take sufficient account of the endless variations in these sugars. Three additional tests are described. *To det. the yield and purity of the sugar after washing:* A satd. soln. of the raw sugar itself is made. 92 cc. of this soln. is made into a magma with 200 g. of the raw sugar. This is spun for 2 minutes in a 5-inch centrifugal and the weight and purity of the sugar are detd. after drying 2 hrs. at  $98^\circ$ . *To det. the amount of defecation required and the rapidity of filtration:* A definite amt. of a standard strength raw sugar soln. is treated with successive and increasing amts. of an acid Ca phosphate soln. of known strength and neutralized each time with standard calcium sucrate. After each treatment the test tube in which the expt. is carried out is heated and allowed to settle, and the minimum amt. of the acid phosphate which will cause rapid settling and give a clear supernatant liquor is noted. When this amt. has been detd., 100 cc. of a  $45^\circ$  Brix sugar soln. is defecated with the amts. of acid phosphate and calcium sucrate found necessary by the above

test, the soln. is heated to 190° F. and then filtered through a triple thickness of folded filter bag cloth. The time of filtration is noted. *To det. the readiness with which the sugar yields its color to bone black:* Ten g. of raw sugar are dissolved in 30 cc. of water, and boiled with 0.25 g. of Filtercel and 2 g. of bone black, finer than 60 mesh. The amt. of color absorbed may be estd. by comparing the color of filtrate against a tintometer standard. On the basis of the above tests, certain amts. should be added to or subtracted from the price paid for raw sugars by the refiners. J. K. DALE.

**The role of oxidases and of iron in the color changes of sugar-cane juice.** F. W. ZERBAN. *J. Ind. Eng. Chem.* 10, 814-7(1918).—Chlorophyll, saccharetin and anthocyanin do not account for all the color in sugar-cane juices. Several oxidizing enzymes have been reported as occurring in cane juices and Schneller has shown that part of the color is due to the interaction of ferric salts with polyphenols occurring in the juice. Further expts. were made to see if the dark color of cane juice could be explained on the basis of the iron-polyphenol reaction and the oxidation of the iron salts to the "ic" condition by the natural oxidases of the juice. Young cane shoots were used because, though they are rich in polyphenols, they contain very little coloring matter. When ground in a porcelain mortar the color was dark brown instead of the usual dark green of mill juice; however, when a trace of  $\text{FeSO}_4$  was added the usual dark green color was obtained. It is concluded that the first brown color was due to the action of oxidases upon the polyphenols, while the green was due to the combined action of the iron salt and the oxidases on the polyphenols. Cane shoots were cut up and dropped into water. The mixt. turned brown on standing. When the above expt. was repeated with boiling water the mixt. remained colorless for days. If either ferrous or ferric iron salts were added to a cold-water ext. of the shoots the dark green color was obtained. Ferrous iron added to a hot-water ext. of cane shoots gave a colorless soln. which slowly turned green. Ferric iron added to a hot-water ext. gave a dark green color immediately. These expts. show that the color of a raw juice depends upon the presence or absence of oxidizing enzymes and the presence or absence of iron salts. Tests were made to identify the oxidizing enzymes in the young shoots. The best method found was first to ext. slices of the shoots with alc. and then add these extd. slices to the test soln. A number of polyphenols were used in these expts., the tests being made in neutral, slightly acid and slightly alk. soln. The presence of both a laccase and also a tyrosinase was shown by the color reactions, especially with paracresol, hydroquinone, pyrogallol, guaiacol and tincture of guaiac. The test for oxidases with potassium iodide starch soln. also gave positive results. The activity of both laccase and tyrosinase diminishes rapidly, but the peroxidase reaction with  $\text{H}_2\text{O}_2$  and tincture of guaiac could be obtained in juices that had been preserved with toluene for weeks. J. K. DALE.

**The preparation of an active decolorizing carbon from kelp.** F. W. ZERBAN AND E. C. FREELAND. *J. Ind. Eng. Chem.* 10, 812-4(1918).—The giant kelps of the Pacific Coast were used as the basis for the experimental prepn. of carbons capable of decolorizing sugar solns. Three factors were found to have an important effect upon the decolorizing power of the final product, first the point in the process at which the sol. salts are washed out; second, the method by which the material is carbonized; third, the temp. to which the char, after carbonization, is heated in a closed vessel. The decolorization tests were made by adding 5 g. of the carbon under examn. to 200 cc. of a 3% soln. of low grade molasses, bringing the soln. just to the boiling point and immediately filtering through a folded filter. The resulting filtrate was then compared with one obtained under the same conditions, but with 5 g. of Norit as the decoloring agent. The material used consisted of three different samples (A) kelp dried in a rotary kiln, (B) incinerated kelp prepd. in a revolving incinerator, (C) kelp that had

been subjected to destructive distn. (A) was carbonized by charring in an open saucepan until fumes ceased to come off, or by heating in an iron retort with a  $\frac{1}{4}$ -in. descending iron condensing tube. The first series of expts. showed the effect of leaching with water and acids. Chars made as above were heated to bright redness in closed iron cylinders and leached with acid or water either before or after this heating. In each case a better decolorizing carbon was obtained by leaching after heating, rather than before. An especially active carbon was made by heating the incinerated kelp and then boiling out with acid followed by water. Expts. to det. the best method for carbonizing the kelp gave more or less uncertain results, due to experimental difficulties, but seemed to show that the best results were obtained when the raw material was carbonized quickly at a comparatively high temp. in such a way that the fumes could escape quickly. Carbonization alone is not sufficient to make an active decolorizing carbon. No matter what process was used in charring the kelp, it was found that the higher the temp. to which this char was heated in a closed vessel, the better was its decolorizing power. A good carbon was made in one operation by heating to redness a sample of dried kelp in a closed iron cylinder, but with one of the caps only loosely screwed on, then boiling it out with water and acid. It is suggested that the high N content of the kelp may be responsible for the great decolorizing power of the carbons made from it.

J. K. DALE.

The preparation of several useful substances from corn cobs. F. B. LA FORGE AND C. S. HUDSON. *J. Ind. Eng. Chem.* 10, 925-7(1918); cf. *C. A.* 11, 1956.—An address describing methods of prepn., products obtained, and uses. "The yields of the various products constitute approx. the following % of the wt. of the dry corn cobs: adhesive gum, 30; cryst. xylose, 5; AcOH, 2.5 to 3; cryst. glucose, 37."

F. W. SMITHER.

Extracting sugar by diffusion. L. NAUDET. U. S., 1,281,057, Oct. 8. Sugar is extd. from beets by passing the juices through a series of diffusion cells, successively recharged, the denser portions of the extn. juice are reheated and passed through the newly filled cell to raise the temp. of the material in it before extn. and less dense portions are withdrawn from the system.

Glucose. C. HOPKINSON. Brit., 118,651, July 3, 1917. Glucose is produced from carbonized waste, that is to say, the friable hydrocellulose obtained by treating waste textile materials contg. both animal and vegetable fibers with a mineral acid. The carbonized waste is boiled with mineral acid and neutralized, and the ppt. so formed is removed. In an example, 1 part of the waste is mixed with 3 parts of 65-70%  $H_2SO_4$ , and the mixt. is allowed to stand for 3-4 hrs., and is afterwards dild. till the liquor contains 1-2% acid. The dild. liquor is boiled for 1 hr. The product is neutralized with  $CaCO_3$ , the ppt. is filtered off, and the residual liquid is evapd. to obtain the glucose.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

Notes on the Procter-Hirst test for sulfite cellulose. FINI ENNA. *J. Am. Leather Chem. Assoc.* 13, 438-40(1918).—The author has noted Yocum and Nelson's letter (*C. A.* 12, 2140) expressing doubt as to the reliability of the Procter-Hirst reaction and calls their attention to the Appellius-Schmidt reaction (*C. A.* 9, 251) which he believes does not fail positively or negatively. An abstract of Appellius and Schmidt's methods for the detection of wood-pulp in exts. and leather and also means of differentiating between Neradol D and wood-pulp follows.

R. W. FREY.

**Notes on the Procter-Hirst test for sulfite-cellulose.** J. H. YOCUM AND E. S. NELSON. *J. Am. Leather Chem. Assoc.* **13**, 395-6(1918).—A continuation of the work mentioned previously (*C. A.* **12**, 2140) on the Procter-Hirst test (*C. A.* **3**, 2395). A liquor was prepd. from spruce wood by extg. with NaOH and nearly neutralizing with HCl. The liquor alone gave only a slight ppt. after 24 hrs. standing by the Procter-Hirst test. Fifty cc. of the liquor plus 4 cc. NaHSO<sub>3</sub> gave immediately a slight ppt.; 50 cc. of liquor plus 4 cc. NaHSO<sub>3</sub> when heated gave at once a heavy ppt.; the NaHSO<sub>3</sub> liquor alone gave a slight ppt. on standing. These expts. were repeated on the wood liquor after standing several days and gave the same results. After this 50 cc. of the wood liquor was evapd. with 4 cc. NaHSO<sub>3</sub> until the NaCl and other salts were largely pptd. The soln. was filtered and the filtrate gave a slight ppt. by the P.-H. test. The pptd. salts after washing in satd. soln. of NaCl were dissolved in H<sub>2</sub>O and gave no ppt. with the P.-H. test. However, on combining the soln. of the pptd. salts and the filtrate from them a heavy ppt. was given by the P.-H. test. This pptn. may have been aided by the presence of the NaCl. All these reactions seem to confirm the authors' original statement "that the lignones of themselves do not react with the P.-H. test but that the presence of the sulfo-radical in an org. complex apparently does precipitate. It is felt that the detn. of the presence of sulfite-cellulose liquors in tanning solns. needs further study and that too much credence cannot be given to this test."

R. W. FREY.

**The effect of hard water on tannins. Committee report.** T. A. FAUST. *J. Am. Leather Chem. Assoc.* **13**, 409-17(1918); cf. *C. A.* **11**, 2624.—The work was confined to the analysis of tanning exts. and liquors from them, using distd. H<sub>2</sub>O and hard waters artificially prepd. by the addition of chemicals in the proportion of 50 parts to 100,000. The following chemicals were used: CaH<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub>, MgH<sub>2</sub>(CO<sub>3</sub>)<sub>2</sub>, CaSO<sub>4</sub>, MgSO<sub>4</sub>, and NaCl. The exts. employed were chestnut, chestnut oak bark, hemlock and quebracho. As a general thing when the exts. were dissolved in the artificial hard waters and analyzed by the usual method an appreciable loss of tannin was found, but when 50° Bk. liquors were made up from the exts. with these hard waters and then analyzed using distd. H<sub>2</sub>O practically no loss in tannin occurred. The results are tabulated and a brief discussion of the work is given.

R. W. FREY.

**Principles of extraction of tanning materials.** E. G. KEINER. *Hide and Leather*, Aug. 17, 29, 1918; *J. Am. Leather Chem. Assoc.* **13**, 512-4(1918).—A brief discussion of the open and closed methods of extg. tanning materials. The advantages of the latter are: easier and better movement of the liquor and a cleaner liquor with less color. There is also a saving of 30 to 40% in steam with the closed method. The cost of repairs is less in the closed extraction.

R. W. FREY.

**Leather substitute.** G. H. BRUCE. U. S., 1,280,957, Oct. 8: A material for the manuf. of shoe soles is formed of a sheet of rubber mixed with fiber (e. g., cotton) glued to a sheet of cardboard or other material which can be molded under heat and pressure to form shoe arches. Cf. *C. A.* **12**, 2712.

**Glue, etc.** L. MAUERHOFER. *Brit.*, 118,119, Aug. 9, 1918. In digesters for the steam treatment of glue and the like, more especially in the leather industry, the glue instead of being treated in the mass, is placed in thin layers on perforated plates fitted one above the other on a central perforated pipe, which distributes the steam rising from the lower part of the digester. The glue accumulates in a reservoir removable bodily with the perforated plates. In a modification, the reservoir is replaced by a perforated plate through which the glue passes directly into the H<sub>2</sub>O below.

# CHEMICAL ABSTRACTS

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No. 2

## I. APPARATUS.

L. C. JONES.

Extraction apparatus for the laboratory. BESSON. *Mitt. Lebensm. Hyg.* 9, 234 (1918).—Although never experiencing the objections of Schwalbe and Schulz (*C. A.* 12, 2145) regarding his extn. app. (*C. A.* 10, 133), B. believes their improvements to be valuable.

H. A. LEPPER.

A special stopcock for dropping liquids arranged for equalizing the pressure above and below the outlet in the stopcock. HARRY L. FISHER. *J. Ind. Eng. Chem.* 10, 1014-5 (1918), illus.

E. J. C.

A new timing device for simplifying the thermometric reading of calorimetric determinations. CHAS. A. MYERS, JR. *J. Ind. Eng. Chem.* 10, 1015-6 (1918), illus.

E. J. C.

Notes on the use of the pressure gage for Pitot-tube measurement. EVALD ANDERSON. Lab. Western Pptn. Co., Los Angeles. *Chem. Met. Eng.* 19, 250 (1918).—The difficulty usually experienced with such pressure gages due to the shift of the zero point is overcome by fitting each connection tube with a T and nipple just above the gage and connecting the two by a rubber tube on which there is a Hoffman clamp. By opening the clamp and thus equalizing the pressure the zero point can be read without the trouble of removing the Pitot-tube from the flue or disconnecting one side of the gage.

F. A. HARVEY.

A new method of microscope illumination. A. SILVERMAN. Univ. Pittsburgh. *Chem. Met. Eng.* 19, 508-9 (1918).—The following improvements have been made on the app. described previously (*C. A.* 12, 1606). A new 9-volt, 0.7 amp. daylight lamp has been devised which will give 50% greater illumination. A tube resistance permits use on 107, 112, and 118 v. a. c. or d. c. A shutter has been devised for cutting off the light from half the field. Excellent photomicrographs are obtainable with the new lamp.

F. A. HARVEY.

A new illuminator for microscopes. II. ALEXANDER SILVERMAN. *J. Ind. Eng. Chem.* 10, 1013-4 (1918); illus.; cf. *C. A.* 11, 2977; 12, 1606; and preceding abstr.

E. J. C.

The Abbé and Pulfrich refractometers. ANON. *Engineering* 106, 282-3 (1918).—New types of these instruments are described. The Abbé instrument is designed for rapid detn. of a liquid or solid to the 3rd or 4th decimal place within the range 1.3 to 1.7. By means of an attachment to the telescope daylight or artificial light can be used and by means of a circular scale on this attachment the dispersion between the C and F hydrogen lines can be detd. The liquid film is contained between the 2 hypotenuse faces of 2 dense flint glass prisms. The upper prism has the face polished and the critical edge for total reflection acts as the dividing line which is set on the cross hairs. The corresponding face of the lower prism is grayed to prevent false images. The prisms are water-jacketed and the temp. thermostatically controlled. The instrument may be used for solids. When used in the sugar industry it is supplied with an additional scale giving directly the % of "dry substance" at the standard temp. of 20 or 28°. One of the modifications of the latest design of the Pulfrich

refractometer concerns the micrometer attachment. The arm which clamps the circle and the clamping device are so made that the micrometer readings are accurate without using a correction curve. Each prism is water-jacketed. Another water jacket can be placed over the top of the prism so that only the necessary vertical face is left free. This jacket automatically assumes its correct position as a screw is tightened.

F. A. HARVEY.

ESCARD, JEAN: *Les fours electriques de laboratoire*. Paris: H. Dunod et E. Pinat. 72 pp. 5 fr. 40c.

Acetylene generator. A. A. HOFFMAN. U. S. 1,282,421, Oct. 22.

Acetylene generator. O. Z. FRAZIER. U. S. 1,282,800, Oct. 29.

Acetylene generator. J. S. NOEL. U. S. 1,282,919, Oct. 29.

Acetylene generator. W. H. HILLENBRAND. U. S. 1,283,767, Nov. 5.

Apparatus for sublimation of salicylic acid or similar materials. J. D. SARTAKOFF. U. S. 1,284,787, Nov. 12. The app. is adapted also for subliming S, I or benzoic acid.

Apparatus for separating oil from water. B. G. COLEMAN and R. O. MORRISON. U. S. 1,284,245, Nov. 12.

Apparatus for gasifying liquefied carbon dioxide or other liquefied gases. F. LEVY. U. S. 1,283,823, Nov. 5.

Apparatus for washing and collecting gas. H. HERMANSEN. U. S. 1,283,763, Nov. 5.

Gas-analyzing apparatus. N. H. WENER. U. S. 1,281,729, Oct. 15.

Apparatus for liquefying air and separating it into its constituents. C. F. CROMMETT. U. S. 1,283,472, Nov. 5.

Apparatus for testing hardness of grinding wheels. F. J. TONR. U. S. 1,283,362, Oct. 29.

Apparatus for dissolving salts from ores or other solid materials. P. G. DARLING. U. S. 1,283,099, Oct. 29.

Apparatus for incinerating kelp or similar materials. S. R. OPPENHEIM. U. S. 1,282,708, Oct. 22.

Electric furnace for laboratory use. C. A. PFANSTIEHL. U. S. 1,283,285, Oct. 29. The furnace, which is adapted for miscellaneous lab. work, is provided with a water jacket and with a liquid seal which prevents the escape of gases from the furnace.

Optical pyrometer. P. D. FOOTE and E. H. FISHER. U. S. 1,283,717, Nov. 5.

Valve-packing. C. F. WALLACE and M. F. TIERNAN. U. S. 1,283,994, Nov. 5. A valve-packing is formed by satg. an asbestos rope with a soln. of beeswax in a solvent such as  $\text{CCl}_4$  and then rubbing finely divided graphite into the rope and allowing the solvent to evap.

Stopping holes in metal vessels. F. DIEBOLD. Swiss 77,951, June 17, 1918. A fused mixt. of S, Al powder, and talc is used. E. g., the fused mass may consist of S 600, Al powder 300, talc 100, and animal black 5 g.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

The national aspects of chemistry. W. J. POPE. *Chem. News* 117, 343-6(1918); cf. C. A. 12, 3, 1353. E. H.

Chemistry, a trade or a profession? HANOR A. WEBB. *Sci. Monthly* 7, 530-4 (1918). E. H.

The accountancy of chemical research. F. W. JACKSON. *Chem. Trade J.* 63, 267-8 (1918). E. H.

The purpose of research. H. N. OGDEN. *Science* 48, 525-32 (1918). E. H.

Sir William Ramsay (1853-1916). Ph. A. GUYE. *Rev. gén. sci.* 29, 567-72 (1918). E. J. C.

Jacobus Henricus van't Hoff. ANON. *Sci. Monthly* 7, 563-4 (1918). Biographical note. Van't Hoff in America. BENJAMIN HARROW. *Ibid* 564-8. E. H.

Isaac de Hollander and Jan Isaacs de Hollander. III. W. P. JORISSEN. *Chem. Weekblad* 15, 1343-51 (1918).—A continuation of this historically interesting paper (cf. *C. A.* 12, 4). E. J. C.

Arnold Frederik Holleman, October 21, 1893-October 21, 1918. J. BÖRSSEKEN. *Chem. Weekblad* 15, 1296-1309 (1918).—Chiefly a review of some of Holleman's work in organic chemistry. E. H.

Sketch of the life of A. F. Holleman. W. P. JORISSEN. *Chem. Weekblad* 15, 1309-25 (1918).—A bibliography is included. E. H.

Theobald van Hogelande. F. M. JAEGER. *Chem. Weekblad* 15, 1216-58 (1918).—Biography of this Dutch chemist of the period 1560-1608. E. H.

Definition of valency. F. H. LORING. *Chem. News* 117, 319-22 (1918).—A review with numerous quotations. F. C. HOYT.

Accurate method for measuring the density of gases. O. MAASS AND J. RUSSELL. McGill Univ. *J. Am. Chem. Soc.* 40, 1847-52 (1918).—The vol. of the gas is detd. in a large bulb packed in ice, and the gas is then condensed by means of liquid air into a small tube for weighing. An accuracy of 0.05% is attainable. The values at zero and 1 atm. were: acetylene 1.1695,  $\text{Me}_2\text{O}$  2.1103, and  $\text{HBr}$  3.6397. F. C. HOYT.

Latent heat of fusion as the energy of molecular rotations. KÔTARÔ HONDA. *Sci. Rep. Tohoku Imp. Univ.* 7, 123-30 (1918).—In the mols. of a solid there are rectilinear vibrations about a mean position, and small dependent rotational vibrations about central nuclei. At fusion, the rotational vibrations become complete revolutions. The latent heat of fusion is shown to consist of the energy of rotation gained during fusion:  $w\lambda = nE_{T_m}/2$ , where  $E_{T_m}$  is the energy of 1 g. mol. of liquid,  $n$  the degrees of freedom,  $w$  the at. wt., and  $\lambda$  the latent heat of fusion. By expt. H. proved that for the elements (except where the sp. heat is abnormal or a transformation takes place during fusion),  $w\lambda/T_m = nE_{T_m}/2T_m$ , i. e., that the latent heat of fusion consists of the energy of rotation gained by the mols. during fusion. By arbitrarily choosing  $n$ , the same relation is shown to hold for diatomic compds.; but owing to the ambiguity in the value of  $n$ , this is not taken as proof of the theory. Further evidence is cited in the fact that amorphous substances have little or no latent heat of fusion; they are very viscous liquids and already have the rotational energy characteristic of liquids. Also in *Phys. Rev.* 12, 425-30 (1918). IRENE F. SMITH.

Mutual action of calcium and magnesium salts on their diffusion through colloids, and the physiological meaning of these salts. T. TADOKORO. *J. Tokyo Chem. Soc.* 39, 423-39 (1918).—The diffusion of  $\text{CaCl}_2$ ,  $\text{CaI}_2$ ,  $\text{Ca}(\text{NO}_3)_2$ ,  $\text{CaHPO}_4$ ,  $\text{MgCl}_2$ ,  $\text{MgI}_2$  and  $\text{MgSO}_4$  through colloids, such as milk and the press juice of the young leaves of *Tsai*, was studied. The diffusion velocity of Ca is increased in the presence of Mg salts and that of Mg is retarded by Ca salt. Glucose solns. also diffuse quickly through vegetable cells in the presence of Ca salts but not of Mg salts. S. KOMATSU.

**Chemical resistance. II. Application of the quantum theory in chemical dynamics.** S. HORIBA. *J. Tôkyo Chem. Soc.* 39, 369-86(1918); cf. *C. A.* 10, 2168.—This is an extension of the view of Lewis (*C. A.* 9, 263; 11, 112, 2293). H. assumes that a substance reacts when the mol. absorbs a certain amt. of energy from the surrounding medium and is changed into its active form. The chem. resistance of the reaction system has been expressed as a sum of 2 terms (1) a term proportional to the probability of transmission of energy which must be given to a mol. in order to make the mol. reactive, (2) a term inversely proportional to the probability of migration of the active mass into the sphere of reaction. On the same principle, he proposes a new process of calcn. of the affinity const. S. KOMATSU.

**The variation of electric resistance during the fusion of metals.** HIDRO TSUTSUMI. *Sci. Rep. Tôhoku Imp. Univ.* 7, 93-105(1918); cf. *C. A.* 12, 2274.—In this investigation the sp. resistances of Hg, Sn, Bi, Pb, Zn, Sb, Al, Ag and Cu were studied during fusion. The ratio of sp. resistance of a metal in the liquid and solid state is approx. 2, except for Bi and Sb, whose ratio is roughly  $1/2$ . Probably due to chance,  $WL/T_m$  is also nearly equal to 2, where  $W$  is the at. wt. of the metal,  $L$  the latent heat of fusion, and  $T_m$  the abs. m. p. The abrupt increase in sp. resistance at the moment of fusion is accounted for by the author on the basis of the electron theory as follows: The no. of impacts of free electrons (whose mean velocity is small compared with that of the revolving bound electrons) with revolving electrons increases proportionally with the amplitude of rotational vibration. This latter, at the point of fusion, changes to complete revolution, causing discontinuous change in the number of impacts and hence in the sp. resistance. IRENE F. SMITH.

**The abnormality of strong electrolytes. III. The osmotic pressure of salt solutions and equilibrium between electrolytes.** JNANENDRA CHANDRA GHOSH. *J. Chem. Soc.* 113, 707-15(1918); cf. *C. A.* 12, 1609, 2268.—Clausius has devised an equation of state free from any arbitrary assumption:  $PV = 2/3$  kinetic energy —  $1/3$  virial. From Part I,  $A = nRT \log \mu_\infty/\mu_p$  and  $A$  is the virial. Hence,  $PV = nRT - 1/3 nRT \log (\mu_\infty/\mu_p)$  or  $nRT (1 - 1/3 \log (1/a))$ , where  $a$  is the activity coeff. From the Clausius equation, the value of van't Hoff's  $i$  is  $n (1 - 1/3 \log (1/a))$ . The values of  $a$  for bivalent strong electrolytes corrected for the viscosity ratio  $\eta/\eta_\infty$ , are here applied. From these values of  $a$ ,  $i$  is computed and compared with the corresponding values from the freezing-point lowering data of Noyes and Falk. The agreement between the observed values and those computed from the Clausius equation varies from 0.05% to 0.4%, while with the Arrhenius equation it is from 1% to 2.5%. For ternary electrolytes the Clausius equation gives by far the better values. For mixed solns.  $\log (1/x') = \log (1/y') = k (2/(V + V'))^{1/2}$  is obtained, where  $x'$  and  $y'$  are the activity coefficients of the components,  $V$  and  $V'$  their respective dilns., and  $k$  is a const. F. C. HOYT.

**Electrolytic conductivity in non-aqueous solutions. II. The electrical conductance of trimethyl-*p*-tolylammonium iodide in water and several organic solvents.** HENRY JERMAIN MAUDE CREIGHTON and D. HERBERT WAY. Swarthmore College. *J. Franklin Inst.* 186, 675-98(1918).—The cond. of this compd. was detd. in aq. soln., and in soln. in each of the following solvents: MeOH, EtOH, propionaldehyde, benzaldehyde, anisaldehyde, acetone, HCOOH, AcOH, EtCN, PhCN, nitromethane, nitrobenzene, and epichlorohydrin. The temp. of the expt. was usually 25°. In aq. soln. Ostwald's diln. law was not followed; however,  $k$  did not vary with the concn. of the solute when the equation of Storch was used, i. e.,  $\alpha^n + (1 - \alpha) v^{n+1} = k$ . The conductance in aq. soln. at 25° was found to be 40.3. The equiv. cond. at infinite diln., detd. by calcn. or extrapolation, varied from 13 for anisaldehyde to 188 for acetone, the temp. being 25°; it was greater in an aliphatic solvent than in the corresponding



aromatic solvent; in an homologous series, it was greater the nearer the solvent stood to the beginning of the series; its magnitude was influenced most by the aldehyde group, least by the carboxyl group; among the values obtained were: nitromethane 115, nitrobenzene 38, EtCN 143, PhCN 54, propionaldehyde 120, benzaldehyde 33, water 116, Me alc. 100, Et alc. 48, HCOOH 90, AcOH 25, epichlorohydrin 44. By the same procedure, the equiv. cond. at infinite diln. was found to be 28 for Et alc. at 0°, 29 for benzaldehyde at 18°, 36 for nitrobenzene at 18°, and 145 for acetone at 18°.

JOSEPH S. HEPBURN.

Artificial coloration of spherulites with helicoidal development (tartrates and bimalates). PAUL GAUBERT. *Compt. rend.* 167, 368-70(1918); cf. Wallerant, *C. A.* 1, 1958.—The spherulites are easily obtained by the evapn. of a very thin layer of soln. upon a plate of glass. The temp. and velocity of crystn. have an important influence upon the production of the spherulites. Ammonium bimalate gave only hemihedral forms ( $1/2$ , b.  $1/2$ ) when the soln. was heated to incipient decompn. These forms rarely appear and have not been obtained by other observers. The helicoidal structures show the existence of enantiomorphous forms. Optical examn. shows that the development is not the same in all of the spherulites. By coloring the crystals during growth with methylene blue the internal condition of the crystals indicated by pleochroism is shown. A soln. of  $\text{NaHC}_4\text{H}_4\text{O}_6$  evapd. at different temps. gives crystals or spherulites of varying optical properties. By coloring with methylene blue the spherulites of the hydrated salt appear violet-blue and those of the anhydrous salt red-violet, all very pleochroic. Bitartrates of  $\text{NH}_4$ , Rb, and Tl yield helicoidally developed spherulites of which the fibers and simple crystals are colored by methylene blue. The max. absorption is independent of the sign of the crystal, the mechanism of the coloration being the same as that of the crystals or fibers of ammonium bimalate or  $\text{NaHC}_4\text{H}_4\text{O}_6$ .

L. W. RIGGS.

The determination of the limiting values of the medium refractive index of a finely crushed biaxial crystal by the immersion method. SEITARO TSUBOI. *J. Geol. Soc. Tokyo* 35, 38-41(1918).—The following method for the detn. of  $\beta$  is presented, based on the principle (of which proof is given) that the value of  $\beta$  is always between the two  $n$ s to be observed in a crystal grain of any orientation. The finely crushed fragments of a biaxial crystal are immersed successively in liquids of different  $n$  and the detn. is made on each fragment whether the  $n$  of the liquid  $p$  is above or below or lies between, the two values of  $n$  of the fragment,  $n_1$  and  $n_2$ . If the results are  $n'_1 < n'_2 < p'$  in any one trial and  $p'' < n''_1 < n''_2$  in another, then  $\beta$  will be detd. from the relation:  $n_1 \leq \beta \leq n_2$  as  $p'' < \beta < p'$ . The difference between the upper and lower limiting values of  $\beta$ ,  $p' - p''$ , may be made as small as 0.003 by repeating the process on a large no. of grains of various orientation, with different liquids.

S. G. GORDON.

Crystallography and optical properties of three aldopentoses. EDGAR T. WHERRY. *Bur. Chem. J. Am. Chem. Soc.* 40, 1852-8(1918).—The isomers available for crystallographic study were  $\alpha$ -d-lyxose,  $\alpha$ -d-xylose, and  $\beta$ -d-arabinose. A complete description of their crystals is given, and striking relationships in angles are pointed out. The same 3 and also  $\alpha$ -l-arabinose were examd. optically; the results are given in detail. The sp. grs. were also detd. by suspension, and the refractivities calcd., the values being somewhat less than the theoretical. Finally a determinative table is presented for the rapid and certain identification of these sugars by their optical properties as observed under the microscope.

E. T. W.

Retardation by sugars of diffusion of acids in gels (GRAHAM) IIA.

JAEGER, F. M.: Elementen en atomen, eens en thans. Schetsen uit de ontwikkelingsgeschiedenis der elementenleer en atomistiek, voor studeerenden in de natuurwetenschappen aan Nederlandsche Universiteiten en Hoogeschoolen Groningen-Dea Haag. 268 pp. 8.75 f.

SUTHERLAND, L. L.: A Guide in the Study of Chemistry. Staunton, Va.: The McClure Co. 235 pp.

TRAUTZ, M.: Praktische Einführung in die allgemeine Chemie. Leipzig: Veit & Comp. 350 pp. Mk. 14.50.

VITORIA, EDUARDO: Importancia de los coloides en la quimica contemporanea. Barcelona: 30 pp.

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

The interference fringes developed by friction and electricity in certain anisotropic liquids. F. GRANDJEAN. *Compt. rend.* 167, 494-6(1918).—Exptl. observations are made upon a number of substances capable of forming liquid crystals, using a microscope both with and without nicols, and plates of different solids. Friction or electricity develops a particular structure which is such that light waves in traversing undergo interference and display color. The same phenomenon is observed with reflected light for friction only and may be explained by the fact that such light is more intense in the regions which show color in transmitted light than in the normal regions. The colors persist only momentarily after friction has ceased, or with the disappearance of the elec. field.

G. L. CLARK.

Absorption spectra of aqueous solutions of complex nickel, chromium and copper salts. Y. SHIBATA AND K. MATSUNO. *J. Tokyo Chem. Soc.* 39, 661-706(1918).—The absorption spectra of aq. solns. of the following salts were studied:  $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$ ,  $[\text{Cr en}_3]\text{Cl}_3$ ,  $[\text{Cr en}_3](\text{SCN})_3$ ,  $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ ,  $[\text{Cr}(\text{NH}_3)_5\text{H}_2\text{O}]\text{Cl}_2$ ,  $[\text{Cr}(\text{NH}_3)_5(\text{SCN})](\text{SCN})_2$ ,  $[\text{Cr}(\text{NH}_3)_5\text{Cl}\cdot\text{H}_2\text{O}]\text{Cl}_2$ ,  $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2\cdot\text{H}_2\text{O}]\text{SO}_4$ ,  $[\text{Cr en}_2\text{Cl}_2]\text{Cl}$ ,  $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3\cdot\text{H}_2\text{O}]\text{NO}_3$ ,  $\text{Cr}(\text{NH}_3)_3(\text{SCN})_3$ ,  $[\text{Cr}(\text{NH}_3)_2\text{Br}_2(\text{H}_2\text{O})_2]\text{Br}$ ,  $[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4]\text{NH}_4$ ,  $\text{Cr}(\text{SO}_4)_3\cdot 18\text{H}_2\text{O}$ ,  $\text{Cr}_2(\text{SO}_4)_3\cdot 6\text{H}_2\text{O}$ ,  $[\text{Cr}(\text{C}_2\text{O}_4)_3]\text{K}_3$ ,  $[\text{Cr}(\text{SCN})_6]\text{K}_3$ ,  $\text{CrO}_3\cdot 3\text{NH}_3$ ,  $\text{CrO}_4\cdot 3\text{KCN}$ ,  $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$ ,  $[\text{Ni}(\text{NH}_3)_6]\text{SO}_4$ ,  $[\text{Ni}(\text{N}_2\text{H}_5)_3]\text{Cl}_2$ ,  $[\text{Ni en}_3]\text{Cl}_2\cdot 2\text{H}_2\text{O}$ ,  $2\text{NiSO}_4\cdot 5\text{NH}_3\cdot 7\text{H}_2\text{O}$ ,  $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2\cdot 6\text{NH}_3\cdot 3\text{H}_2\text{O}$ ,  $[\text{Ni}(\text{NH}_3)_4]\text{SO}_4\cdot 2\text{H}_2\text{O}$ ,  $[\text{Ni}(\text{N}_2\text{H}_5)_2]\text{Cl}_2$ ,  $[\text{Ni en}_2]\text{Cl}_2\cdot \text{H}_2\text{O}$ ,  $[\text{Ni}(\text{NH}_3)_3]\text{Cl}_2\cdot 3\text{H}_2\text{O}$ ,  $\text{NiSO}_4\cdot 7\text{H}_2\text{O}$ ,  $\text{NiCl}_2\cdot 6\text{H}_2\text{O}$ ;  $[\text{Cu}(\text{Py})_4](\text{NO}_3)_2$ ,  $[\text{Cu}(\text{Py})_4](\text{NO}_3)_2$ ,  $[\text{Cu}(\text{Py})_3](\text{NO}_3)_2$ ,  $[\text{Cu}(\text{Py})_2](\text{NO}_3)_2$ ,  $\text{Cu}(\text{NH}_3)_2(\text{C}_2\text{H}_5\text{O}_2)_2$ ,  $\text{Cu}(\text{NH}_3)_2(\text{C}_2\text{H}_5\text{O}_2)$ ,  $\text{Cu}(\text{NH}_3)_2\text{Cl}(\text{C}_2\text{H}_5\text{O}_2)\cdot \text{H}_2\text{O}$ ,  $\text{Cu}(\text{C}_2\text{H}_5\text{O}_2)_2\cdot \text{H}_2\text{O}$ ,  $\text{Cu}(\text{NH}_3)_2\text{C}_2\text{O}_4$ ,  $\text{Cu}(\text{NH}_3)_4\text{C}_2\text{O}_4\cdot 2\text{H}_2\text{O}$ ,  $\text{Cu}(\text{NH}_3)_2\text{C}_2\text{O}_4$ ,  $\text{CuNH}_3\cdot \text{C}_2\text{O}_4$ ,  $\text{Cu}(\text{NH}_3)_4\text{SO}_4$ ,  $\text{Cu}(\text{NH}_3)_6\text{SO}_4$ ,  $\text{CuSO}_4\cdot 5\text{H}_2\text{O}$ ,  $\text{CuCl}_2\cdot 2\text{H}_2\text{O}$ . *Conclusions:* (1) Cr complexes stable in aq. soln. show 2 or 3 absorption bands which vary according to the nature of the groups with which Cr is associated. All rules for Co complexes apply to Cr compds. (2) Ni salts unstable in aq. soln. show 2 max. absorptions in the neighborhood of  $\lambda$  1700 and 2800. (3) Cu complexes being very unstable in the aq. soln. have the tendency to decompose into their components. They show only end absorption in red or violet region which is characteristic of the Cu complex.

S. KOMATSU.

The structure of the bismuth line  $\lambda$  4722. LESTER ARONBERG. Univ. Chicago. *Astrophys J.* 47, 102-3(1918).—The results of Lunelund (*Ann. Physik* 34, 305(1911)), and Wali-Mohammad (*C. A.* 8, 3393), are incorrect. The true wave length of each of the components, in international units, starting with the strongest one is as follows: 4722.379, -.435, -.481, -.619, -.663, -.697.

F. A. HARVEY.

Spectrum of the isotopes of lead. LESTER ARONBERG. Univ. Chicago. *Astro-phys. J.* 47, 96-101 (1918).—The line  $\lambda$  4058 has a wave length 0.0045 Å longer for radio-lead from Australian carnotite, at. wt. 206.318, than for ordinary Pb. This agrees in sign but is about 100 times greater in magnitude than the shift calcd. from Bohr's equation. The fact that there is an actual shift of the line in the ordinary Pb and not a mere broadening suggests that ordinary Pb is a pure isotope and not a mixt. of radium and thorium Pb.

F. A. HARVEY.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

**Electric furnace in the steel foundry.** W. E. MOORE. *Iron Age* 102, 1206-7 (1918).—The increasing use of elec. furnaces in the steel foundry is noted and the use of an acid-lined type, so designed and constructed that it is adaptable to basic operation, is advised. A comparison is given of costs of converter and acid elec. steel. All possible facilities should be utilized and the best type of equipment under existing power supply used. Tractor and truck fields provide a growing market for high-grade steel castings, as well as railroads, agricultural implement manufacturers, and machine tool builders.

W. A. BOYNTON.

**Electric furnaces in metallurgy. The Heroult furnace.** ANON. *Electrician* 81, 538, 608 (1918).—A comprehensive illus. description. The cost at the present time is difficult to estimate exactly, and varies considerably at different works. The great advantage possessed by the elec. furnace at the present time is that it can melt miscellaneous steel scrap alone without the addition of any pig Fe, and make a large variety of steel of remarkable purity. The main costs are as follows: (a) *Power*: This varies from 650 to 800 K.W. hrs. per ton, according to the nature of the scrap, the material to be made and the efficiency of the shop. (b) *Labor*: One melter, one helper and one or two laborers are employed on the furnace itself. (c) *Electrodes*: The consumption of amorphous C electrodes is usually from 30-40 lb. per ton, and of graphite electrodes 12-16 lbs. per ton of steel cast. (d) *Repairs*: This is not an expensive item. The life of the roof varies with the size of the furnace and other conditions between 80 and 200 heats; the bands are fettled with dolomite between the heats. (e) *Other Charges*: Additions, tools, overhead charges, ladle, etc., vary greatly according to the class of steel made and the shop conditions. Owing to the high quality of a large proportion of the turnings now available it is frequently unnecessary to refine, and in this case an acid lining presents many advantages. The expensive magnesite brick is avoided, the roof lasts longer as it is not splashed with lime, and in the case of foundries, scrap castings, etc., covered with sand, can be re-melted without cutting the lining, as in the case of a basic furnace. The furnace can be converted into a basic furnace at any time by changing the lining, no other alterations being necessary.

C. G. F.

**New type of electric furnace.** ANON. *Elec. Rev. West. Elec.* 73, 950 (1918).—Brief description of the Greene Furnace. It is of the rolling cylinder, arc type. The 3-ton furnace at Seattle has 2 5-inch graphite electrodes requiring from 500 to 600 kw. 2-phase, 100 to 110 volts. A 3-ton charge of scrap steel is melted in 2 to 3 hrs. The scrap is deoxidized by the Greene slag process, the slag being composed of sand, clay or lime. The slag dissolves the Fe oxides which are in turn reduced by adding powdered coke or ferro-Si to the charge. The elimination of Fe oxides obviates imperfect castings due to blow holes. The newer type of 3-ton furnace has 3 electrodes, 3 phase current and a 400 kva. transformer. The shell of the furnace is made of 3/4-inch boiler plate.

C. G. F.

Some recent advancements in the electrical industry of the United States. E. W. RICE. *Rev. gén. sci.* 29, 551-4(1918). E. J. C.

Electric smelting of ferromanganese ores in California. ANON. *Elec. Rev. West. Elec.* 73, 940(1918).—The two 3-phase Noble furnaces at Heroult are smelting 400 tons of ferro-Mn ore per month. The ore averages 45% Mn and 15% SiO<sub>2</sub>. The product contains 70% Mn. The elec. supply is 2600 to 3000 kw., a. c., 60 cycle, 40 to 80 volts on the secondaries. C. G. F.

Electric treatment of airplane forgings. D. D. MILLER. *Iron Age* 102, 381-5 (1918).—A detailed description of a recent installation of a Baily furnace for heat-treating axle forgings at the plant of the Ingalls-Shepard Forging Co. The forgings pass through a stationary resistance reverberatory elec. furnace, are discharged into a quenching tank, and deposited in the drawing furnace, in one continuous process. The furnace is an automatic pusher type and consists of two parts, the first for hardening and quenching, and the other for the drawing process. Each part comprizes a stationary rectangular metal enclosure containing a hearth 20 ft. X 7 ft. insulated by means of high-grade fireclay bricks. The furnace will heat 72 tons in 24 hrs. to 870°. The first part is rated at 600 kw. and designed for 2-phase 60-cycle operation, the second at 300 kw. and operates on single-phase. The heating troughs are rectangular, open at the top, and consist of a highly refractory carbide mixed with a binder. The troughs are filled with finely broken C or graphite, which acts as a resistor. The current is supplied by Cu electrodes fastened to the ends. At either end of both sections of the furnace are heat-insulated charging- and discharging-doors which are counterweighted and slide up and down. A hydraulic manipulator located between the discharge end of the heating section and the charging end of the drawing section removes the material from the heating section, quenches it and places it on the operating platform of the drawing section from where it is charged into this section by the pusher mechanism. The entire automatic operation is accomplished by hydraulic power, with the exception of the motor-driven time limit device used in the quenching operation. Material requires 3 hrs. for passage through both sections. Results indicate attainment of the desired precision and uniformity of treatment.

W. H. BOYNTON.

Ceric oxychloride produced by the electrolysis of cerous chloride. H. ARNOLD. *Z. Elektrochem.* 24, 137-8(1918); *J. Soc. Chem. Ind.* 37, 505-6A(1918).—A brown amorphous hygroscopic deposit is produced on the cooler parts of the anode upon electrolysis of fused CeCl<sub>3</sub>. It consists of NH<sub>4</sub>Cl, CeOCl<sub>2</sub> and water. CeOCl<sub>2</sub> is produced only while the melted CeCl<sub>3</sub> contains water.

W. H. BOYNTON.

Manufacture of mine disinfectant. ANON. *Eng. Mining J.* 106, 786(1918).—Hypochlorite is used at the Falcon mine in Rhodesia for treating wounds, washing out drinking buckets, etc. Electrolysis is effected in a wooden box, the electrodes consisting of six C anodes and six C cathodes. The anodes must be of high grade. A continuous current passes through salt soln.; the resultant hypochlorite is clarified in a sand filter and transferred to earthenware jars.

W. H. BOYNTON.

Electroplating engineering. C. B. WILLMORE. *Metal Ind.* 16, 209-11, 364-5, 466-7(1918); cf. *C. A.* 10, 855 2072; 12, 1151.—These instalments deal with problems of elec. measurements, tracing current leakage, voltage losses and their prevention, conductivity of plating solns. and study of conductance as a factor in roto-plater design.

W. H. BOYNTON.

Transformer for laboratory tests. GUINO LAZZARINI. *Rome. Ann. chim. applicata* 10, 1-22(1918).—A transformer is described having the following advantages: (1) It permits variation of a. c. between the limits of 5-440 volts. (2) It will furnish

2500 amp. at 5-10 volts. (3) Changing of the ratios of transformation is easy and rapid, even by one unskilled in the use of the app. The transformer is applicable to calibrating of elec. instruments, and elec. furnace operation. A description of the app. is given, together with illus. and methods of using it. R. S. POSMONTIER.

**Electrically heated ovens.** ANON. *Elec. Eng.* 52, No. 6, 28(1918).—Refers in particular to enameling ovens; Kiln type oven, hand operated: 6 to 8 lbs. of work (sheet iron, etc.) per kw. hr.; kiln type oven, truck operated, 10 to 12 lbs.; continuous conveyor-type oven, 25 to 30 lbs. C. G. F.

The behavior of phosphates at the anode (FICHTER, MÜLLER) 6. Electrolytic oxidation of benzene (CLAUDIUS) 10. Electric furnace for laboratory use (U. S. pat. 1,283,285) 1.

HALE, A. G.: *The Application of Electrolysis in Chemical Industry.* London: Longmans, Green & Co. 148 pp. 7s. 6d.

**Arc-lamp electrode.** I. LADOFF. U. S. 1,281,796, Oct. 15. Electrodes capable of producing a relatively steady arc are formed of  $\text{Fe}_2\text{O}_3$  14, Fe 9, Ti oxide or ilmenite 17, Na uranate 0.46 and Cr oxide 1.25 parts.

**Carbon electrodes.** S. E. SIEURIN. U. S. 1,282,475, Oct. 22. Electrodes for electric furnaces are formed by heating the electrode material such as anthracite or coke in an elec. resistance furnace to near the temp. at which the C would be graphitized. This treatment serves to produce electrode material of good conductivity and resistance to burning.

**Carbon furnace electrodes.** S. E. SIEURIN. Brit. 119,164, Dec. 15, 1917. Anthracite, coke, or other carbonaceous material is converted into a product suitable for the manuf. of furnace electrodes by heating it in an elec. furnace to a temp. between 1800 and 2000° which is a little below that of graphitization. An energy consumption of 1000 kw. hr. per ton is sufficient, i. e., about a third of that generally necessary for transformation to graphite.

**Electrodes for deposition of copper from solutions.** W. K. PAGE. U. S. 1,283,280, Oct. 29. In making electrodes of silicon-Fe in metal molds, the mold is preheated to about 300°, the molten metal is cooled to about the lowest temp. at which it is still sufficiently fluid to be cast and is then poured into the mold. Cu lugs are cast into the electrode and it is removed from the mold while still at about a cherry-red heat and tempered in a bed of kieselguhr to give it a dense, fine resistant structure for a considerable distance from the surface.

**Securing connecting parts of battery plates.** I. M. NOBLE. Can. 187,244, Oct. 29, 1918. The connector post of battery plates is secured to the battery cover by inserting the post through an aperture in the cover, then heating the part of the post above the cover to fuse the metal slightly and pressing the metal down around the edge of the opening in the cover. The tool for use in this process is specified.

**Molded electric conductors.** J. P. A. MCCOY. Can. 187,645, Nov. 26, 1918. An elec. conductor composed of a molded mass of pulverulent conducting material bound together with a binder containing at least one of a group of substances such as indene, coumarone and their isomers and polymerization products is made by molding the material with the binder and heating to expel nearly all the binder.

**Electric battery.** H. WILHELM and H. OLANETA. U. S. 1,283,005, Oct. 29. Battery electrodes of C are wrapped with paper or other non-porous material, to prevent undesirable penetration of material placed around the paper casing.

**Dry-cell electric battery.** I. PLETCHER. U. S. 1,283,292, Oct. 29. A soln. for recharging dry cell batteries is formed of HOAc 2 oz., "acid vinegar" 1 qt., salicylic acid 1 oz. and phenol 0.5 oz. .

**Dry-cell electric battery.** E. H. ROLLINSON. U. S. 1,284,458, Nov. 12. Structural features.

**Dry cells.** C. HAMBURCHEN. Can. 187,416, Nov. 12, 1918. A cold soln. of  $\text{ZnCl}_2$  and  $\text{NH}_4\text{Cl}$  is prepd. and mixed with a cereal; then the cold mixt. is introduced into the container around the electrodes and allowed to gelatinize thereon. The electrolyte thus comes into direct contact with the Zn cup and the negative electrode and no space is occupied by inert bibulous material.

**Dry-cell electric battery.** E. L. MARSHALL. U. S. 1,281,409, Oct. 15. Zn cans of dry-cell batteries are lined with cloth or paper. Wet uncooked flour paste is applied to the dry lining and dried upon it before the lining is placed in the Zn can and after placement in the can the lining and flour paste are moistened to secure uniform action on the Zn.

**Dry-cell electric batteries.** L. R. RHOADES. U. S. 1,281,421, Oct. 15. The pat. relates to a method of fixing a bibulous lining in a Zn can by use of paste.

**Primary electric battery.** R. W. ERWIN. U. S. 1,282,057, Oct. 22. A negative element formed of a mixt. of Cu oxide and S is used in a primary elec. battery with an alk. electrolyte. Use of 1-5% of S effects an increase of about 0.2 volt in the voltage of the battery.

**Storage battery.** J. A. WOOD. U. S. 1,282,159, Oct. 22. Structural features.

**Storage battery.** W. MORRISON. U. S. 1,284,746, Nov. 12. Structural features.

**Storage battery.** W. MORRISON. U. S. 1,284,424, Nov. 12. Structural features.

**Negative plate for storage batteries.** W. MORRISON. U. S. 1,284,425, Nov. 12. In the manuf. of storage battery negative plates, the grid is sand-blasted, filled with Pb oxide and the latter is then electrolytically reduced to spongy Pb in a soln. of  $\text{MgSO}_4$ , which effects an intimate association of the reduced Pb with the metal of the grid.

**Storage battery electrode.** W. MORRISON. U. S. 1,284,426, Nov. 12. In forming storage battery electrodes, the filler mass, which may be formed from  $\text{PbO}$ ,  $\text{Pb}_2\text{O}_3$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$ , is satd. with  $\text{H}_2\text{O}$  and the plate is then formed in an electrolyte of  $\text{H}_2\text{SO}_4$ .

**Storage battery.** M. R. HUTCHISON and C. W. NORTON. U. S. 1,283,779, Nov. 5. Structural features.

**Depolarizer for electric batteries.** M. E. HOLMES. U. S. 1,281,372, Oct. 15. Ammonium phosphomolybdate is used as a depolarizing material in elec. batteries of the dry-cell type.

**Electric furnace.** J. O. BOVING. U. S. 1,281,280, Oct. 15. The furnace is of the vertical-electrode type and is adapted for melting metals.

**Electric furnace for effecting gas reactions.** A. V. LIPINSKI. U. S. 1,281,604, Oct. 15. The app. is arranged for subjecting gases to an elec. arc flame magnetically spread into sheet form.

**Electric furnaces.** E. L. CROSBY. Can. 187,422, Nov. 12, 1918. An elec. furnace has in combination a rotatable refractory shell, a pair of travel rings engaging thereabout, though variantly spaced therefrom, a series of supporting rollers whereon the travel rings move, thereby turning the shell about a constantly variant axis, means for causing the rotative movement of the rings and electrodes adjustably engaging through the ends of the shell.

**Electric melting furnaces.** T. F. BAILY and F. T. COPE. Can. 187,423, Nov. 12, 1918. An elec. furnace of the resistance type has a heating chamber, a hearth located in the bottom of the chamber, a circular resistance element located above the hearth and a roof so arranged above the resistance element that heat rays radiating upwardly from the resistance element will be reflected upon the hearth while heat rays radiating downwardly will strike directly upon the hearth.

**Calcium cyanamide and phosphorus pentoxide.** E. W. HASLUP. U. S. 1,281,363, Oct. 15. Finely divided phosphate rock mixed with an excess of C is heated to about 1200° while producer gas is passed through the mixt. to drive off the P present and to produce CaO in the residue. The temp. is then raised to about 1500° while the producer gas is still passing through the charge, to form  $\text{CaCN}_2$ . P and P oxides thus obtained are burned to produce  $\text{P}_2\text{O}_5$ .

**Calcium cyanamide.** G. E. COX. U. S. 1,282,381, Oct. 22. In nitrifying  $\text{CaC}_2$  in combustible inner containers held in strong perforated outer containers, the containers are placed in the nitrifying oven before the charge of  $\text{CaC}_2$  is placed in them. Expts. are stated to have shown an increase in fixation of N by this method over the practice of filling the containers elsewhere and then transporting them several hundred feet to the ovens as has been usual previously.

**Electrodeposition of zinc.** G. H. CLEVINGER. U. S. 1,283,077, Oct. 29. Co is removed from  $\text{ZnSO}_4$  electrolytes containing Mn by neutralizing the electrolyte with CaO or ZnO and then pptg. the Co by the addition of an oxidizing agent such as  $\text{KMnO}_4$ . U. S. 1,283,078 specifies the addition of  $\beta$ -naphthol,  $\text{NaNO}_2$  and acid to the electrolyte, forming nitroso- $\beta$ -naphthol which ppts. the Co. Cf. C. A. 12, 1858.

**Electrodeposition of nickel from a nickel-copper anode.** G. A. GUESS. Brit. 118,629, Aug. 14, 1918. A Ni-Cu anode in a  $\text{NiSO}_4$  soln. is maintained in contact with a reagent which forms with  $\text{CuSO}_4$  an insol. Cu compd. and a non-injurious sulfate. The cathode is screened from the reagent and receives a deposit of Ni. Suitable reagents are limestone, CaO, or similar alk.-earths, which give insol. sulfates, or  $\text{NiCO}_3$ , which forms additional  $\text{NiSO}_4$ . The reagent may be kept in suspension, in which case the cathode is in a porous pot. Alternately, pieces of the reagent may be placed in a porous pot around the anode. The electrolyte may be heated to 60-80°.

**Steel from scrap metal.** S. S. WALES. U. S. 1,282,660, Oct. 22. Solid scrap metal is charged into an elec. furnace and molten semi-steel is added to form a coherent mass, which is then melted and refined in the furnace to produce a steel of the desired compn.

**Ferrosilicon.** G. C. FURNESS. U. S. 1,284,645, Nov. 12. Ferro-Si is formed in an elec. furnace by smelting between deeply embedded electrodes a charge containing  $\text{SiO}_2$ , anthracite coal, coke, charcoal or other reducing agent high in C, bituminous coal and Fe ore, scrap steel or other Fe-bearing material, in which the bituminous coal is in a coarser state of division than the other carbonaceous material.

**Shaped castings of iron silicide.** N. G. PETINOT. Can. 187,437, Nov. 12, 1918. Iron and quartz or sand are melted in an elec. furnace with C which reduces the charge so that Fe and Si which are properly proportioned, unite to form a compd. containing 10 to 16% Si. The compd. is poured while molten into molds so as to produce acid-resisting castings. A mixer or holder is attached to the elec. furnace for maintaining the temp. of the molten compd. until sufficient material is produced for a complete casting.

**Electric extraction of zinc.** E. S. BERGLUND. Can. 187,455, Nov. 19, 1918. Zn powder collected in the condenser is subjected to a rubbing and compression action

in the condenser. A screw conveyor in the lower end of the condenser forces the powder through an opening into the receiver.

**Calcium cyanamide.** AKTIEBOLAGET NITROGENIUM. Swiss 77,932, June 17, 1918. In the manuf. of  $\text{CaNCN}$  from  $\text{CaC}_2$  and N gas, the  $\text{CaC}_2$ , which has been intimately mixed with indifferent substances and a catalyzer before being charged into the furnace, is vigorously agitated in the furnace in the presence of N with a view to carrying out the reaction quickly, uniformly, and completely, with prevention of sintering of the mass or dissociation of the  $\text{CaNCN}$  formed.

**Cyanides; nitrides.** A. R. LINDBLAD. Brit. 119,243, Sept. 17, 1918. In the production of cyanides and nitrides in an elec. furnace, the N or nitrogenous gas such as air is drawn into the charge from above by applying suction at a lower level.

**Electrolytic cell for liberating gases from fused electrolytes.** J. L. MALM. U. S. 1,284,403, Nov. 12.

**Electroplating.** M. M. MERRITT. U. S. 1,282,258-9-60, Oct. 22. Lasts for making rubber shoes, or other articles, are formed by treating a wooden core with paraffin, water glass or shellac to waterproof it and with a substance to render it elec. conductive and then electroplating Cu upon it.

**Electroplating.** W. THUM and J. J. MULLIGAN. U. S. 1,283,973, Nov. 5. In directly electroplating the surfaces of Fe, steel and other base metals, the surface to be plated is coated with a protective layer of gelatin and the article is then subjected, in a plating bath, for a short time, to the action of an elec. current of abnormally high d. and then the current d. is reduced to that normally used and continued until a plating of the desired thickness has been formed. The coating with gelatin and preliminary treatment with the current of high d. serve to produce a firmly adhering deposit when Cu or Pb is the coating metal.

**Electroplating with iron.** F. A. SHEPHERD and BRAZIL, STRAKER & CO. Brit. 119,200, Apr. 26, 1918. An Fe-plating electrolyte is made by boiling an aq. soln. containing, for each gal. of  $\text{H}_2\text{O}$ , approx. 2 lbs.  $\text{FeSO}_4$ , 3 oz.  $\text{NH}_4\text{Cl}$ , and 1.5 lbs. divided Fe, there being also added, before or during boiling, 0.25 oz.  $\text{KBr}$ , 0.166 oz.  $\text{NaCl}$ , and 0.166 oz.  $\text{H}_3\text{BO}_3$ . The last three substances are preferably dissolved by boiling and stirring in  $\frac{1}{12}$  of the total  $\text{H}_2\text{O}$  employed, before addition to the boiling Fe soln. The latter soln. should be boiled for a period proportional to the quantities employed; when 12 gals. of  $\text{H}_2\text{O}$  are taken the time required is 10 hrs. The divided Fe is stated to dissolve. Anodes of rolled Fe or mild steel may be used. Steel, Fe, brass, Cu, or other metals may be plated. A pressure of 4 v. and a c. d. of 1 amp. per sq. in. of cathode are suitable.

**Electrolytic refining of bronze anodes.** HÜTTENWERK NIEDERSCHÖNEWEIDE AKT.-GES. VORM. J. F. GINSBERG. Swiss 78,126, June 17, 1918. A soln. containing, besides  $\text{CuSO}_4$ , as electrolyte, up to 12% alkali bisulfate, is used to prevent the formation of stannic acid in the electrolyte.

**Electrolytic production of iron.** A. ESTELLE. Swiss 78,296, July 1, 1918. Hydrated Fe oxide compds. are suspended in a soln. of caustic alkali and the resulting mixt. is electrolyzed.

**Electrodeposition of tin.** H. SARRAMEA. Brit. 119,451, Aug. 13, 1918. See Swiss 76,562 (C. A. 12, 1364).

**Rare-earth metals and chlorine by electrolysis.** ALPHA PRODUCTS CO. Brit. 119,229, Sep. 2, 1918. Electrolysis of a fused salt of Ce or the like is carried on as a continuous run for not less than 8 hrs., say 24-6 hrs., the salt being sufficiently pure to prevent clogging and to permit agglomeration of the metal. Waste material ob-



tained in the gas-mantle industry, and consisting of the oxides or dissolved chlorides of Ce and other metals, may be employed in the production of Ce alloyed with small quantities of La, Di, Er, Th, etc. The oxides may be dissolved in HCl, an excess of the oxides being used. S and P compds. may be removed by Ca or Ba chloride, and Cl-carrying elements of dual valency, such as Fe, and Al, by Ce oxide. The proportion of impurity of each class should be reduced below 3%. The soln. may then be evapd. to dryness. Formation of oxychlorides is prevented by either of two methods. In one method, the dry product is fused in an atm. of HCl gas, which may subsequently be dried for re-use or employed in dissolving Ce oxide or carbonate or the oxide waste above referred to. In the other method, about 15% of NaCl or KCl and a like amt. of  $\text{NH}_4\text{Cl}$ , based on the wt. of rare-earth chlorides, are added before evapn. of the purified solns. After fusion, the proportion of NaCl diminishes below 9%. In this case, the alkali metal chloride accumulates in the electrolytic cell, and may be subsequently dissolved in HCl and purified for re-use. Volatilized  $\text{NH}_4\text{Cl}$  also may be recovered. Fusion is preferably effected in thick pots of cast Fe rich in C and Si, holding preferably more than 100 lb. of salts, which are kept boiling for 20 min. or until evolution of impurities ceases. It is preferable to cast the fused salts in shallow Fe pans or on plates, but they may be transferred directly to the cell. A small quantity, say 5 lb., of salt, preferably prepd. by the second method, is placed in the Fe or clay cell which may be about a foot in diam. and heated first by a gas burner and then by a current of 200 amp. For the first hr. about 1 lb. of the salt is added at intervals of 10-5 min., the current being gradually increased to 900 amp. Subsequently about 2 lbs. of the salt are added every half hr., and the current is increased to 1200-50 amp. during the second hr., being then kept const. A temp. of  $850^\circ$  is maintained. The anode c. d. should not exceed 6-7 amp. per sq. in. for graphite, or 5.5 amp. per sq. in. for C. At the cathode, the c. d. should be about  $\frac{1}{2}$  or  $\frac{1}{4}$  of that at the anode. The anode is accurately adjustable and is maintained at less than an in. from the fused metal of the cathode. A pressure beginning at 12 v. and diminishing to 7 is employed. At intervals of about 2 hrs., the electrolyte is stirred by means of the anode or of a heavy Fe rod. If the electrolyte prepd. by the second method is used throughout, the temp. is raised to  $950^\circ$  during stirring. At the end of the run, say from the 24th to the 27th hr., the cell is heated as strongly as it will stand, by the gas flame and by a current of 15 amp., with stirring every half-hr., to agglomerate the Ce, etc., produced. The charge is finally stirred and allowed to solidify in the cell, which if of cast Fe may then be broken up, as it is attacked by the Ce and cannot be used again with safety. If the electrolyte is prepd. without addition of NaCl, a larger cell and a longer run, say 50-60 hrs., are permissible.

**Sodium perborate.** O. LIEBKNECHT. U. S. 1,281,983, Oct. 15. Na perborate is produced by electrolyzing a soln. of Na borate and  $\text{Na}_2\text{CO}_3$  in the presence of a cathode of Pb, Fe, Ni, Cu, Ag or C or other material which acts *per se* as a catalyzer to the perborate, while protecting the exposed portion of the cathode against the combined action of the electrolyte and air by covering with Pt or by maintaining the entire cathode out of contact with the air.

**Electrolytically depositing metal upon airplane propellers.** M. M. MERRITT. U. S. 1,282,265, Oct. 22. Airplane propellers are coated with a plurality of layers of Cu or other metal, by electrodeposition, with intervening thin layers of grease. U. S. 1,282,268 and 1,282,270 also relate to electrodeposition of metals on propellers.

**Tubular metal articles electrolytically formed.** M. M. MERRITT. U. S. 1,282,269, Oct. 22. In forming manifolds for internal-combustion engines or similar articles, an elec. conductive coating such as graphite is applied to a mold or core, a comparatively coarse-grained layer of Cu is electrolytically deposited on the coated core, this deposit

is amalgamated with Hg and a second layer of Cu of finer grain is then deposited upon the amalgamated surface, to strengthen the article. U. S. 1,282,266 and 1,282,267 relate to manifolds or other articles similarly formed.

**Copper tubes electrolytically formed.** M. M. MERRITT. U. S. 1,282,261, Oct. 22. Mandrels for the electrolytic manuf. of Cu tubes are formed of brass or steel with their surfaces amalgamated with Hg. This treatment serves to facilitate removal of the deposited Cu from the mandrel.

**Forming metal sheets electrolytically.** M. M. MERRITT. U. S. 1,282,262, Oct. 22. In electrolytic formation of sheets of Cu or other metal by deposition of the metal on a rotating cathode, the latter is partially submerged in the electrolyte and rotated at a speed so regulated that a portion of the electrolyte is carried, in a film, over the unsubmerged portion of the cathode. The latter is coated with a thin layer of grease at the beginning of the operation and the mode of operation serves to smooth the grease film and prevent the adherence of occluded H<sub>2</sub> to the cathode.

**Copper sheets electrolytically produced.** M. M. MERRITT. U. S. 1,282,263, Oct. 22. In forming Cu sheets by electrodeposition upon a rotating cylindrical mandrel, the formation of irregular deposits on or near the edges of the plates is prevented by placing a conductor adjacent to the edges of the cathode and passing an elec. current through this conductor. U. S. 1,282,264 relates to the formation of Cu sheets on a rotating mandrel after first winding string coated with shellac or other non-conducting material upon the mandrel in the form of a helix to facilitate tearing the Cu sheet into an elongated strip after deposition.

**Electrolytic recovery of copper from ores.** A. A. LOCKWOOD. U. S. 1,282,892, Oct. 29. An acid pulp is formed of roasted Cu sulfide ore mixed with H<sub>2</sub>O or acid leaching soln. and this pulp, agitated and aerated by injecting air into it, is led into an electrolytic vessel and Cu is electrolytically deposited. An insol. anode is used, and air is introduced into the lower part of the mixt. undergoing electrolytic treatment, to prevent settling of the suspended solids in the mixt. The pulp from the electrolytic vessel is then returned to the bulk of acid pulp and the cycle of operations is repeated.

**Electrolytic production of caustic alkali.** H. H. DOW. U. S. 1,284,618, Nov. 12. In causticizing alkali metal chloride solns., there is added to the anode chambers of a plurality of sep. electrolytic cells of the diaphragm type a quantity of the soln. greater than the diaphragms can transmit by percolation and the excess soln. is drawn off after treatment and passed successively through all the cathode chambers in the series of cells. This manipulation of the electrolyte tends to minimize consumption of elec. energy, anode erosion and formation of undesired by-products.

**Separating suspended matter from gases.** L. BRADLEY. Brit. 119,236, June 21, 1917. In the elec. pptn. of suspended matter from gases, the cond. of the gases is improved by adding an agent such as H<sub>2</sub>O, steam, or H<sub>2</sub>SO<sub>4</sub> vapor. The gases may be maintained under pressure to prevent inward leakage of air. The sepn. of particles such as soot may be rendered more effective by wetting them. When the sepd. particles are deliquescent as in the case of potassiferous blast-furnace dust, the temp. should be kept high enough to keep the insulators dry.

**Treating used electrolyte of primary batteries.** S. H. SHEIB. U. S. 1,281,857, Oct. 15. Used alk. electrolyte of primary batteries is collected in a drum, allowed to remain quiescent until oils have risen to the surface, and the soln. is drawn off from beneath the oils and electrolyzed to recover the Zn.

**Incandescent lamps with tungsten filaments.** F. W. GILL. U. S. 1,284,648, Nov. 12. The light-giving portion of W filaments of incandescent elec. lamps is coated with NaCl in insufficient amt. to produce discoloration of the bulb or to cause appre-

cable attack on the exposed metal in the lamp when the latter is in use, and the lamp is assembled and sealed and the temp. of the coated filament is raised to incandescence to drive off the NaCl from the filament. This treatment serves to diminish obscuration of the bulb.

**Ductile tungsten.** C. A. PFANSTIEHL. U. S. 1,282,122, Oct. 22. Ductile W is produced by compressing finely powdered W to a d. greater than 15.5 (preferably about 16.02) and then fusing the particles together electrically in an atm. of H while supported in a cradle of ductile W through which the elec. current is passed.

## 5. PHOTOGRAPHY.

LOUIS DERR.

**Examination of organic developing agents.** H. T. CLARKE. *J. Ind. Eng. Chem.* 10, 891-5(1918).—Details of procedure for identification and quant. detn. of the commoner photographic developing agents and some typical analyses of metol developers are given.

L. DERR.

**Multicolor photographic film.** J. E. THORNTON. U. S. 1,281,714, Oct. 15. A celluloid or other transparent support is coated with an adhesive substratum, finely subdivided figures are mechanically printed upon it to form a screen for color photography, an adhesive layer is applied over the screen with an overlying coating of panchromatic gelatin-AgBr emulsion with a yellow filter interposed between the multi-color screen and panchromatic emulsion.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

**Gallium.** L. M. DENNIS AND J. A. BRIDOMAN. *J. Am. Chem. Soc.* 40, 1531-61 (1918).—The crude material employed was about 35 g. of an alloy of Ga and In containing about 8% In, 1% Zn and traces of Cd and Cu. By ocular observation of the spark spectrum 0.0046 mg. Ga and 0.0013 mg. In could be detected in the solns. of the chlorides; both principal lines were visible when 0.014 mg. Ga and 0.0065 mg. In were present. Large excess of either element was found to impair but slightly the delicacy of these tests. Traces of Zn could not be detected by this method; by photographing the arc spectra of mixtures of the chlorides Zn and In could be detected when the weight of the Zn and of the In is only 0.005% of the weight of the Ga present. By fractional electrolysis of slightly acid solns. of the sulfates, Zn could be entirely removed and In nearly completely. Fractional distn. of the chlorides gave Ga containing less than 0.005% of In or Zn. Methods were devised for the analysis of mixtures containing Ga, In, Zn and Al. Two new Ga salts were prepd.,  $\text{Ga}_2(\text{SeO}_4)_3 \cdot 16\text{H}_2\text{O}$  and  $\text{CsGa}(\text{SeO}_4)_2 \cdot 12\text{H}_2\text{O}$ . One part  $\text{Ga}_2(\text{SeO}_4)_3 \cdot 16\text{H}_2\text{O}$  dissolves in 1.74 parts water at 25°; 1 part of the Cs alum in 24.1 parts water. One part  $\text{NH}_4\text{Ga}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$  dissolves in 3.24 parts of water; in 4600 parts of 50% EtOH; in 11400 parts 70% EtOH at 25°. One part  $\text{CsGa}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$  dissolves in 66.2 cc. water; in 25800 parts 50% EtOH; in 28000 parts 70% EtOH, at 25°.

A. R. MIDDLETON.

**Preparation of certain organic chlorostannites and chlorostannates.** J. G. F. DRUCE. *J. Chem. Soc.* 113, 715-8(1918); cf. C. A. 12, 1622.—These new salts were prepd. from HCl solns. of the component halides: *diethylamine chlorostannite*,  $(\text{NH}_4)_2\text{H}_2\text{SnCl}_4$ , very deliquescent, m. 58°; *o-toluidine chlorostannite*,  $(\text{C}_7\text{H}_7\text{N})_2\text{H}_2\text{SnCl}_4$ , fine silky needles, sol. in cold water, m. 164°; *o-toluidine chlorostannate*,  $(\text{C}_7\text{H}_7\text{N})_2\text{H}_2\text{Sn}$

$\text{Cl}_4\text{H}_3\text{O}$ , pale pink needles, decompn. begins at  $210^\circ$ ; *methylaniline chlorostannite*,  $\text{C}_7\text{H}_7\text{N}.\text{HSnCl}_4$ , stout, colorless prisms, sol. in water and  $\text{EtOH}$ , not in  $\text{CHCl}_3$ , m.  $106^\circ$ ; *methylaniline chlorostannate*,  $(\text{C}_7\text{H}_7\text{N})_2.\text{H}_2\text{SnCl}_4$ , colorless crystals, sol. in water, not hydrolyzed even when boiled, m.  $251^\circ$  (decompn.); *m-phenylenediamine chlorostannite*,  $\text{C}_6\text{H}_4(\text{NH}_2)_2.2\text{HSnCl}_4$ , silky prisms, m.  $128^\circ$ , sol. in water; *m-phenylenediamine chlorostannate*, colorless crystals, m.  $265^\circ$  (decompn.), sol. in cold water, not hydrolyzing unless heated; *p-phenylenediamine chlorostannite*, opaque, white crystals, sol. in cold water, readily hydrolyzed on slight warming, m.  $270^\circ$  (decompn.); *p-phenylenediamine chlorostannate*, pearly plates, sol. in cold water, ppt. forms on boiling, m.  $230^\circ$ ; *benzylamine chlorostannite*,  $\text{C}_7\text{H}_7\text{N}.\text{HSnCl}_4$ , silky crystals, soften at  $95^\circ$ , decompn. at  $210^\circ$ ; *benzylamine chlorostannate*,  $(\text{C}_7\text{H}_7\text{N})_2.\text{H}_2\text{SnCl}_4$ , shining flakes, m.  $112^\circ$ ; *p-methylbenzylamine chlorostannite*,  $\text{C}_8\text{H}_{11}\text{N}.\text{HSnCl}_4$ , m.  $107^\circ$ , slowly sol. in water, soln. soon decomps.

A. R. MIDDLETON.

Separation of traces of copper from solution. J. E. SAUL AND D. CRAWFORD. *Analyst* 43, 348(1918).—Dissolve 0.1% of quinosol in the aq. soln. containing Cu and let stand overnight. A voluminous ppt. of the Cu salt is obtained, in yellowish flocculent masses consisting of bundles of delicate needles sol. in dil. HCl. A soln. of  $\text{CuSO}_4$  containing 0.0002% Cu yielded a distinct ppt. which could be easily collected. Salts of other common metals did not yield ppts. in high dilns., although one was obtained from a strong soln. of a  $\text{Hg}^{++}$  salt.

F. W. SMITHER.

The behavior of phosphates at the anode. FR. FICHTER AND JAKOB MÜLLER. Univ. Basel. *Helvetica Chimica Acta* 1, 297-305(1918).—Schmidlin and Massini obtained two perphosphoric acids by the action of  $\text{H}_2\text{O}_2$  on  $\text{P}_2\text{O}_5$ , *monoperphosphoric acid* and *perphosphoric acid*, to which they gave the formulas  $\text{H}_2\text{P}_3\text{O}_8$  and  $\text{H}_4\text{P}_3\text{O}_{10}$ . F. and M. develop a method for making these acids electrolytically. With Pt electrodes and a soln. of K or  $\text{NH}_4$  phosphate containing  $\text{CaF}_2$  and  $\text{K}_2\text{CrO}_4$  yields of about 30% can be obtained. The chromate prevents reduction of the per-acids formed. The  $\text{H}_2\text{P}_3\text{O}_8$  and  $\text{H}_4\text{P}_3\text{O}_{10}$  are sepd. by their rates of oxidation of a  $\text{H}_2\text{SO}_4$  soln. of KI. The first causes instant pptn. of I; the second only on standing for 24 hours. For a 2 M soln. of  $\text{K}_2\text{HPO}_4$  the soln. should be 4N in KF and contain 0.32 g.  $\text{K}_2\text{CrO}_4$  per l. The yield is better at low temps., being 10% at  $25^\circ$ ; and 23% at  $5^\circ$ , which is the best temp. Low current density increases the yield, and 0.010 amp./cm<sup>2</sup> gives 34% yield, calcd. on the basis of the current. The condition of the Pt surface has great influence on the yield, as has also the ratio of acid to base. With  $\text{NH}_4$  phosphate the yield is not so good, but with  $\text{Rb}_2\text{HPO}_4$  35% of the theoretical is obtainable. The free acid and the sodium salt gave poor results.

F. C. HORT.

The rate of oxidation of nitric oxide. E. BRINER AND E. FRIDÖRI. *Helvetica Chim. Acta* 1, 181-5(1918); *J. chim. phys.* 16, 279-321(1918).—The oxidation of NO, first believed to be quite simple, was shown by numerous expts. to be very complex. The following reactions may occur in the oxidation: (1)  $2\text{NO} + \text{O}_2 = 2\text{NO}_2$ , (2)  $4\text{NO} + \text{O}_2 = 2\text{N}_2\text{O}_3$ , (3)  $\text{NO} + \text{NO}_2 = \text{N}_2\text{O}_3$ , (4)  $2\text{N}_2\text{O}_3 + \text{O}_2 = 4\text{NO}_2$ , (5)  $2\text{NO}_2 = \text{N}_2\text{O}_4$ . Obviously, the equil. of the system will be controlled by the reaction whose rates are slowest, and these are, therefore, of greatest importance. A known mixt. of NO and air is passed into the oxidation chambers, which consist of a series of glass tubes in a thermostat. Stopcocks at various points enable a measurement of the progress of oxidation at different sections in the path of gas flow to be made. A first coil cooled to  $-80^\circ$  by  $\text{CO}_2$  snow and alc., condenses out  $\text{NO}_2$ ,  $(\text{N}_2\text{O}_4)$  and  $\text{N}_2\text{O}_3$ . A second coil immersed in liquid air retains the NO. After this sepn. is effected the contents of the first coil are driven into  $\text{H}_2\text{SO}_4$  which is then passed into a Lunge nitrometer. This detn. gives the amt. of NO transformed into  $\text{NO}_2$ ,  $(\text{N}_2\text{O}_4)$  and  $\text{N}_2\text{O}_3$ . The contents of the second coil are evapd. and treated with  $\text{O}_2$  to render them sol. in  $\text{H}_2\text{SO}_4$  and then

analyzed in a nitrometer. In detg. the order of the reaction no single phase of the process was considered but the process in general, so as to det. the order av. and characteristic of the process. Calcns. showed that the order of the reaction varied as it progressed, the av. value being about 2. The rate of the reaction was shown to increase with decrease in temp. This unusual behavior, which was previously noted by Bodenstein and Meinecke, may be used to advantage in improving the recovery of oxides of N. The av. value obtained for the order of the reaction is reconciled with the third order equation for the reaction rate:  $dx/dt = kC^2NOCO_2$ . Since the  $O_2$ , being in large excess, may be considered of const. concn., the term  $CO_2$  drops out and the equation becomes of the second order. The oxidation of NO to  $N_2O_4$  and  $N_2O_3$  may then be expressed as  $dx/dt = k(A - x)^2$  where  $A$  is the initial concn. of NO and  $x$  the fraction transformed in the time  $t$ . This relation gives us a means of calcg. the time required for a given oxidation and *vice versa*. An examn. of the integrated expression  $kt = x/[A(A - x)]$  shows that the rate of reaction is proportional to the concn.

T. SHEDLOVSKY.

Absorption spectra of aqueous solutions of complex nickel, chromium and copper salts (SHIBATA, MATSUNO) 3.

DENNIS, L. M.: *Problems in Inorganic Chemistry*. Geneva, N. Y.: W. F. Humphrey. 41 pp. \$0.25.

HOLLEMAN, A. F.: *Leerboek der anorganische chemie*. Groningen—The Hague: J. B. Wolters, 622 pp. 9.50 f.

## 7. ANALYTICAL CHEMISTRY.

R. G. R. ARDAGH.

Analysis of mixtures containing gallium, indium, zinc and aluminium. L. M. DENNIS AND J. A. BRIDGMAN. *J. Am. Chem. Soc.* 40, 1549-57(1918).—Two samples are prepd. for analysis, the one for the detn. of Zn, Ga and Al contg. not more than 0.1 g. of Zn, and the other for the detn. of In, Ga and Al which should not contain more than 0.1 g. of In. Ga and Al are detd. in the sample in which each is present in the most suitable amt. In the 1st sample Zn is detd. by double pptn. with  $K_2Hg(SCN)_4$ . To detn. In and Ga in the filtrate, the Hg is removed as HgS, the In by double pptn. with excess NaOH and the remaining soln. is boiled with  $Na_2SO_3$  in slightly acid soln. to ppt. Ga and Al as hydroxides. In the absence of Al, the ppt. is dissolved in HCl and the  $Ga(OH)_3$  repptd. by  $Na_2SO_3$  and weighed as  $Ga_2O_3$ . If Al is present, Ga and Al are sepd. by treating the solp. of the combined hydroxides in HCl with gaseous HCl in the presence of a vol. of ether equal to that of the aq. soln. The hydrated  $AlCl_3$  is redissolved in  $H_2O$  and Al detd. as usual. The remaining soln. is freed from excess HCl and from ether and the Ga detd. as described above. In sample 2, In is detd. by double pptn. with excess of NaOH and repptn. with  $NH_4OH$  and weighing as  $In_2O_3$ ; the Zn is removed by addition of  $K_2Hg(SCN)_4$ ; after removal of Hg, Ga and Al may be detd. as in sample 1.

A. R. MIDDLETON.

Critical study of the Carnot method for determination of potassium salts. CAROLINA ETILE SPAGAZZINI. *Univ. La Plata. Anales soc. quim. Argentina* 6, 196-209(1918).—Turbidity was noted in many instances when alc. was added to the Carnot reagent (double thiosulfate of Bi and Na or Ca); this turbidity disappears when HCl is added

and may be prevented by adding the required amt. of HCl to the Carnot reagent. The amt. of HCl required to produce the optimum acidity of the Carnot reagent should be detd. by means of a 0.1 *N* KCl test soln. at the time each lot of BiCl<sub>3</sub> reagent is prep'd.; the proportion of HCl required varies with each lot of BiCl<sub>3</sub> reagent owing to the variation in d. of the acid used for transforming the subnitrate into BiCl<sub>3</sub>, the accuracy of measurement of the acid, etc. The accuracy of the Carnot method was tested against a 0.1 *N* KCl soln.; the original Carnot technic as well as the procedures indicated by Grandeau and Fresenius were followed. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> was used in some cases and CaS<sub>2</sub>O<sub>3</sub> in others. The results were generally much too high. The variation in results is attributed to a no. of variable factors such as acidity of the reagent, temp. at which formation of the K-Bi compd. occurs, concn. of the K salt to be detd., compn. of the system required for pptn. of the K-Bi compd., etc. The following procedure is recommended for pure, dil. solns. of KCl and KNO<sub>3</sub>: Mix at 12-14° 2 cc. BiCl<sub>3</sub> soln., 1 cc. Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> or CaS<sub>2</sub>O<sub>3</sub> soln. (with pure solns. the result is the same when the Carnot reagent is prep'd. with equal vols. of BiCl<sub>3</sub> and thiosulfate solns.), the required amt. (dild. in 10 cc. alc.) of HCl (of 1.19 d. dild. 1:2) for optimum acidity, and 100 cc. alc. Add drop by drop 2 cc. of 0.1 *N* KCl soln., agitate vigorously, allow to stand 15 mins. at 12-14°, wash the ppt. 3 times by decantation with 5 cc. each of concd. alc. and 2-3 times on a filter with 10 cc. each of alc. Dissolve the ppt. in hot H<sub>2</sub>O, dil. to 500 cc. with distd. H<sub>2</sub>O, add 5 drops 1:2 HCl, 1-2 g. KI, 2 cc. of starch paste and titrate with 0.1 *N* I soln. This method, when applied to KNO<sub>3</sub>, would be slightly modified by adding the KNO<sub>3</sub> soln. drop by drop to the acidulated Carnot reagent at 12-14°, agitating vigorously, then adding the 100 cc. of 96% alc. and again agitating vigorously. Results obtained with K<sub>2</sub>SO<sub>4</sub> were always much too low. The method gave good results with a mixt. of KCl and CaCl<sub>2</sub> when the former was present in excess and inaccurate results when the latter predominated. The method was satisfactory for a mixt. of KCl and MgCl<sub>2</sub> provided there was not a great excess of the latter. When applied to a mixt. of KCl and NaCl the method gave satisfactory results provided the KCl was either present in excess or was present in the same proportion as NaCl; it was not applicable to solns. in which NaCl predominated over the KCl. The method cannot, therefore, be applied with success to unknown mixts. and its use is restricted to certain pure solns. S. gives tabulated data showing the results obtained with KCl solns. of known strength when the acidity of the reagent (at both room temp. and 12°), the temp., the period of standing, and the acidity of the aq. soln. of Bi and K thiosulfate were each varied in turn, the remaining conditions being kept const. in each instance. These data also show in detail the results obtained at different temps. with various mixts. of KCl and CaCl<sub>2</sub>, KCl and MgCl<sub>2</sub>, KCl and NaCl.

H. S. PAINE.

The estimation of potash. T. STEEL. *Analyst* 43, 348-9(1918).—Treat the HCl soln. (obtained by whichever method may best suit) containing Fe, Ca, Mg, etc., but freed from SiO<sub>2</sub>, at once with excess of H<sub>2</sub>PtCl<sub>6</sub>, and evap. on a H<sub>2</sub>O-bath. Cool, take up with a mixt. of alc. 76, ether 13, H<sub>2</sub>O 11, filter, and wash with the same mixt. till free from sol. Pt. Wash the residue on the filter with boiling H<sub>2</sub>O to dissolve all K<sub>2</sub>PtCl<sub>6</sub>, receiving the filtrate in a beaker. Heat the soln. to boiling, add an excess of Na formate, boil a few mins., add an excess of HCl, and heat until the reduced Pt is thoroughly flocculated; collect the Pt on a filter, wash, ignite, and weigh; Pt × 0.4826 = K<sub>2</sub>O. S. states that the method is rapid and accurate, but reports no results. Constituents other than K are estd. in a sep. portion of the sample or soln. (cf. Blount, C. A. 12, 1371; Dyer, *J. Chem. Soc.* 65, 140 (1894)).

F. W. SMITHER.

Assay supplies and the utilization of South African materials in assay offices. T. G. MARTYN. *J. Chem. Met. Soc. S. Africa* 19, 18-22(1918).—Discussion.

Cupels with cement bottoms were found to be good. The mold is first filled with cement, pressed moderately, then filled up with cupellite (bone ash?) and pressed as hard as possible. Crucibles of coarse texture have more endurance when fired. When fine-grained and hard-burned they tend to fissure in use. Necessity for repeated re-use has shown the av. life to be about 18 fusions per crucible. The life is shortened by basic charges (borax, etc.) or by bedding in glowing fuel. A borax substitute "fluxite" is practically, pulverized fluorspar, 10% less should be used. M. believes that in the fusion, this forms fluosilicate, rendering the charge more basic, *e. g.*,  $2\text{CaF} + \text{SiO}_2 = \text{SiF}_4 + 2\text{CaO}$ , the  $\text{SiF}_4$  going to form fluosilicate. When Ag occurs in more than trace in litharge it is never evenly distributed. For assays of low-grade material (residues, tailings, etc.) the Pb button aimed for should be 50 or 60 g.; 20 g. is dangerously low. To get  $\text{CuCl}$ , M. adds a concd. soln. of  $\text{Na}_2\text{SO}_4$  to a mixt. of  $\text{CuSO}_4$  and  $\text{NaCl}$  in soln. in commercial  $\text{HCl}$ . The  $\text{HNO}_3$  used in parting can be economized by redistg. The first run of weak acid might be reserved for cleaning out the still subsequently. Soda ash containing carbonaceous matter is frequently supplied to assay laboratories. Dissolving, filtering, and recalcining may be necessary for some purposes. The necessary heat for parting work can be obtained most economically by having an extra muffle door, which when heated up can be propped up suitably and made to serve as a "hot plate" on which to place an aluminium frying pan carrying the parting capsules.

E. WALLER.

**Estimation of boric acid by the use of manna.** L. E. ILES. *Analyst* 43, 323 (1918).—Manna can be used satisfactorily in the estn. of  $\text{H}_3\text{BO}_3$ . A fresh soln. (waxy portions of material to be discarded), is made for each detn.; it is neutralized and added in the same way as glycerol; usually 5 g. in soln. are equiv. to about 25 cc. 80% glycerol. Analyses of  $\text{H}_3\text{BO}_3$ , boric acid ointment, and borax gave 100.0, 10.0 and 99.9, resp., by this method; corresponding figures obtained using glycerol were 100.0, 9.9 and 99.8.

H. M. LANCASTER.

**The estimation of thiosulfuric, sulfurous, trithionic and sulfuric acids in a mixture.** O. BILLETER AND B. WAVRE. University Neuchatel. *Helvetica Chim. Acta* 1, 174–80 (1918).—It is possible to est.  $\text{H}_2\text{SO}_3$  and  $\text{H}_2\text{S}_2\text{O}_3$  in presence of each other, by first detg. both iodometrically, and then detg.  $\text{H}_2\text{SO}_3$  by a method based on the reaction  $\text{Na}_2\text{S}_3 + \text{Na}_2\text{SO}_3 = \text{Na}_2\text{S} + \text{Na}_2\text{S}_2\text{O}_3$ . This change takes place rapidly near the boiling temp. and is further accelerated by addition of  $\text{NH}_4\text{Cl}$ . The persistence of the yellow color of the reagent serves as a satisfactory end-point. To prep. a *N* soln. of  $\text{Na}_2\text{S}_3$ , sat. 500 cc. *N*  $\text{NaOH}$  with  $\text{H}_2\text{S}$ , remove excess gas under diminished pressure, add an equal vol. *N*  $\text{NaOH}$ , then dissolve in the soln. in the cold, 16 g. S crystallized from  $\text{CS}_2$ . To the flask contg. the soln., join a buret by means of a syphon, and connect both with a gas holder of N for displacing air from the system. Standardize the  $\text{Na}_2\text{S}_3$  soln. gravimetrically. Measure 20 cc. into a soln. contg.  $\text{AcONa}$  and a slight excess of  $\text{AcOH}$ , expel  $\text{H}_2\text{S}$  by boiling in a current of  $\text{CO}_2$ , collect the S on a filter of tared glass wool, dry *in vacuo* over  $\text{H}_2\text{SO}_4$  and weigh. The small amt. of thiosulfate always present in the soln. of  $\text{Na}_2\text{S}_3$  can be detd. iodometrically and the necessary correction applied. The greater the diln., the more rapid is the titration and the more definite is the end point. However, it is not advisable to have more than 100 cc. per 5 cc. reagent. Under these conditions each 100 cc. should contain 5 cc. 2 *N*  $\text{NH}_4\text{Cl}$  and should be slightly alk. (alkalinity equiv. to 4 cc. *N*  $\text{Na}_2\text{CO}_3$  per 50 cc.). A current of  $\text{CO}_2$  should be kept passing over the surface of the liquid during the titration which should require less than 10 min., especially if the approx. titration has been ascertained by previous expt. If trithionate is present, the situation is more complicated. Trithionate is not acted upon by I in the cold but it is converted into thiosulfate by  $\text{Na}_2\text{S}$ , thus:  $\text{Na}_2\text{S}_2\text{O}_6 + \text{Na}_2\text{S} \rightarrow 2\text{Na}_2\text{S}_2\text{O}_3$ . This reaction is slow in the cold, but is rapid at higher temp.;

in presence of  $\text{Na}_2\text{S}_2$ , S is pptd. Heat a dil. soln. with a slight excess of  $\text{Na}_2\text{S}$  or  $\text{Na}_2\text{S}_2$  (in presence of  $\text{NH}_4\text{Cl}$ ) for several mins. near the boiling point, add  $\text{AcONa}$  and a slight excess  $\text{AcOH}$ ; heat for 15 min. in a current of  $\text{CO}_2$ , then titrate with 0.1 N I. Results are good; 0.1785 g.  $\text{K}_2\text{S}_2\text{O}_8$  requires 13.25 cc. 0.1 N I. In the case of a mixt. of sulfite and trithionate, the  $\text{Na}_2\text{S}_2$  produces both changes simultaneously  $\text{Na}_2\text{SO}_3 + \text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{S}_2 \rightarrow 3\text{Na}_2\text{S}_2\text{O}_3$ . If trithionate is present in excess, it is shown by a turbidity due to S which appears after the sulfite is consumed. The turbidity does not interfere with the end-point as the yellow color of the reagent is readily observed. A mixt. for analysis contained 5 cc.  $\text{Na}_2\text{S}_2\text{O}_3$  soln. corresponding to 4.80 cc. 0.1 N I; 2 cc.  $\text{Na}_2\text{SO}_3$  soln. corresponding to 9.19 cc. 0.1 N I and to 1.84 cc.  $\text{Na}_2\text{S}_2$ ; 0.1337 g.  $\text{K}_2\text{S}_2\text{O}_8$  corresponding to 9.88 cc. 0.1 N I. Titration of this mixt. was described; it required 1.90 cc.  $\text{Na}_2\text{S}_2$  and 24.00 cc. 0.1 N I. An alternative method for trithionate is based on the titration of the residual I after heating with excess I soln. under pressure. This follows the titration of sulfite and thiosulfate in the cold. The tetrathionate from the latter is then changed to sulfate, as is the trithionate. The principle appears to be sound but there are many sources of error. Another procedure for detg. trithionate employs the action of heat;  $\text{H}_2\text{S}_2\text{O}_6 \rightarrow \text{H}_2\text{SO}_4 + \text{SO}_2 + \text{S}$ . Acidify the soln. by adding  $\text{HCl}$ , heat near the boiling point in a current of  $\text{CO}_2$  until  $\text{SO}_2$  is all expelled (end of operation detected by dipping the end of the delivery tube into dil. I soln.), filter off the S and ppt. the  $\text{H}_2\text{SO}_4$  with  $\text{BaCl}_2$ . Investigation showed that the ppt. thus obtained contained 97.9–97.5% of the trithionate which was converted into sulfate. In presence of  $\text{H}_2\text{SO}_3$  and  $\text{H}_2\text{S}_2\text{O}_3$  the loss is more or less compensated for by the unavoidable oxidation of the  $\text{H}_2\text{SO}_4$ . If  $\text{H}_2\text{SO}_4$  is also present, it is of course pptd. A known mixt. containing 0.3457 g.  $\text{K}_2\text{SO}_4$  (1.982 millimol.) with 0.1315 g.  $\text{K}_2\text{S}_2\text{O}_8$  (0.486 millimol.) also 1.813 millimol.  $\text{Na}_2\text{S}_2\text{O}_3$  and 2.445 millimols.  $\text{Na}_2\text{SO}_3$ , gave on analysis 2.485 millimols. trithionate and sulfate (100.7% theor.). In dealing with a mixt. of all four acids, oxidize with Br water, ppt. with  $\text{BaCl}_2$  and thus obtain total S as sulfate. The detns. outlined above then complete the data for calcn. of the four constituents. In titrating trithionate by I and  $\text{Na}_2\text{S}_2$ , and detg.  $\text{H}_2\text{SO}_4 + \text{H}_2\text{S}_2\text{O}_3$  gravimetrically,  $\text{H}_2\text{SO}_4$  is thus obtainable by difference. The detn. of total S serves as a check.

H. M. LANCASTER.

**Modification in technic of the Fischer reaction for hydrogen sulfide.** LUCIANO P. J. PALET AND AMANCIO FERNANDEZ. *Anales soc. quim. Argentina* 6, 49–51 (1918).—To a small amt. of  $\text{PhNMe}_2$ , add 2 cc.  $\text{H}_2\text{O}$ , 3–4 drops of a 1% aq.  $\text{NaNO}_2$  soln. and 5 drops of 10%  $\text{HCl}$ . Agitate the mixt. and then neutralize with a cold satd.  $\text{Na}_2\text{CO}_3$  soln. Ext. the nitroso deriv. with  $\text{Et}_2\text{O}$  and to the latter, after decantation, add a small amt. of Zn and several drops of concd.  $\text{HCl}$ . When the green color disappears (completion of reduction) decant the supernatant  $\text{Et}_2\text{O}$ , dil. the remaining liquid with 2 cc.  $\text{H}_2\text{O}$ , add the substance which is to be tested for  $\text{H}_2\text{S}$  and treat the mixt. with concd.  $\text{HCl}$  and  $\text{FeCl}_3$  according to Fischer's technic; formation of methylene blue indicates a positive result. The reaction may be made more perceptible by extg. the methylene blue with alc. If  $\text{HCl}$  is not present in sufficient amt. there is produced a red color due to action of aminodimethylaniline and  $\text{FeCl}_3$  in slightly acid soln.; for this reason it is better to add 1/10 rather than 1/40 by vol. of  $\text{HCl}$ . By this simplification of technic *p*-aminodimethylaniline may be prepd. as needed and the necessity for keeping it in hermetically closed containers is avoided.

H. S. PAINÉ.

**Arsenotungstic and arsenotungstomolybdic complexes as reagents of phenolic amines.** LUIS GUGLIAMELLI. *Anales soc. quim. Argentina* 6, 185–95 (1918).—The action of these reagents (cf. C. A. 12, 664) on phenolic amines containing the groups  $-\text{NH}_2$ ,  $=\text{NH}$  and  $\equiv\text{N}$  was investigated. In the case of the arsenotungstic reagent the characteristic blue color (due to lower oxides of W and Mo) in alk. soln. was ob-



tained with compds. which contain the united groups  $\text{NO-NH}_2$ ,  $\text{H}_2\text{N-NH}_2$ ,  $\text{RHN-NH}_2$ ,  $\text{NHR-NHR}$  or  $\text{NHR-OH}$  (as in hydroxylamine, hydrazine, phenylhydrazine, hydrazobenzene, phenylhydroxylamine) and also with compds. which contain these groups sepd. but attached directly to  $\text{C}_6\text{H}_4$ , naphthalene, purine and pyrazole nuclei (as in *m*- and *p*-phenylenediamine, *p*-aminophenol, etc.). The positive reaction obtained with  $\alpha$ -naphthylamine, aminoantipyrine, pyrimidine, caffeine and purine derivs. such as xanthine, guanine and uric acid in spite of the fact that these compds. do not fulfill the above conditions is attributed to a tautomeric transformation of the mol. or to the influence of the configuration of the (electronegative) nucleus on the reducing action of the groups in question. The arsenotungstomolybdic reagent gave a positive reaction in all cases in which a positive reaction was obtained with the arsenotungstic reagent. In addition the former reagent is sensitive to the presence of a single  $-\text{NH}_2$ ,  $=\text{NH}$  or  $\equiv\text{N}$  group; thus, a positive reaction was obtained with  $\text{PhNH}_2$ ,  $\beta$ -naphthylamine, aminobenzoic acid, tyrosine, aminoacetophenone, etc. A negative reaction was obtained with substituted phenols, while the presence of free phenolic OH groups considerably increased the reducing action of these compds. on the arsenotungstomolybdic reagent; thus, no trace of color was obtained with *p*-phenetidine. The reducing action of phenolic amines is also greatly reduced or even destroyed by the introduction of electronegative groups. Thus, the presence of the acid groups  $\text{SO}_3\text{H}$ ,  $\text{AsO}(\text{OH})_2$  and  $\text{NO}_2$  in sulfanilic acid, atoxyl and nitroaniline, resp., caused the practical disappearance of reducing action. While a negative reaction was obtained with *p*-phenetidine, a positive reaction was obtained with its isomer ethyl-*p*-aminophenol, this being due in the latter instance to the presence of  $=\text{NH}$  and free OH. A distinctly positive reaction was obtained with thiourea and thiosinamine; it is assumed in each case that tautomeric transformation resulted in the formation of SH groups with active reducing action.

H. S. PAINE.

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Separation of traces of copper from solution (SAUL, CRAWFORD) 6.

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KNECHT, E. AND HIBBERT, E.: *New Reduction Methods in Volumetric Analysis (with Additions)*. London: Longmans, Green & Co. 131 pp. 5s.

SCOTT, WILFRED W.: *Qualitative Chemical Analysis*. 3rd Ed. Revized. New York: D. Van Nostrand Co. 350 pp.

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## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

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EDGAR T. WHERRY AND J. H. BOWER.

The numerical relations between the Et curve and the E $\lambda$  curve of the Eifel sandine. S. KÖZU. *J. Geol. Soc. Tokyo* 25, 43-5(1918). S. G. GORDON.

The crystallography and nomenclature of hollandite. L. LEIGH FERMOR. *Rec. Geol. Survey India* 48, 103-20(1917).—Hollandite crystals up to 2 inches long from the Kajhlongri mine, Jhabua State, Central India, were examd. and found to be tetragonal pyramidal,  $c = 0.2039$ , with the principal forms  $m$  (110),  $a$  (100),  $k$  (210),  $p$  (111), and  $q$  (331), and about 57 more or less indefinite forms. Hollandite is considered to be the crystalline form of psilomelane, and a manganate, corresponding to the formula  $\text{H}_2\text{MnO}_6$ , probably a member of the scheelite group. Romanéchite of Lacroix, and possibly coronadite are identical with hollandite. Fermor suggests that the letter  $\alpha$  be prefixed to indicate crystalline phases of amorphous minerals, and the prefix  $\kappa$  to indicate colloidal phases of crystalline minerals.

S. G. GORDON.

**Fayette Co., Texas, meteorite finds of 1878 and 1900 and the probability of their representing two distinct falls.** GEORGE P. MERRILL. *Proc. U. S. Nat. Museum* 54, 557-61(1918).—A re-exam. of thin sections of these stones shows a striking difference in the physical conditions of the two prevailing silicates, the olivine and enstatite. Also the sections of the 1900 stone show numerous chondrules composed wholly of the polysynthetically twinned pyroxene, none of which appear in any of the slides examd. of the 1878 find. The 1900 stone is more deeply oxidized than the 1878, suggesting an earlier fall. The location of the 1900 find is not in line with that of the three fragments of the 1878 find. The name Cedar, Fayette Co. is proposed for the 1900 stone.

L. W. RIGGS.

**"War minerals" as a science.** C. K. LEITH. *Econ. Geol.* 13, 497-9(1918).—A brief outline of the scope of the problems brought up when a mineral becomes a war mineral.

A. B. PECK.

**War minerals.** J. E. SPURR. *Econ. Geol.* 13, 500-11(1918).—A description of the uses and sources of supply in the U. S. and elsewhere of the following metals and minerals; the need of increased production or discovery of high grade or new deposits is emphasized for those in italics: *Sb*, *As*, *asbestos*, *bauxite* and *Al*, *Bi*, *chalk*, *chromite*, *clay*, *Cu*, *cryolite*, *flint grinding pebbles*, fullers earth, graphite, *Fe ore*, magnesite, *Mn*, *Hg*, *mica*, *monazite*, *nitrites*, *Pt*, pyrite, *Sn*, *W*, *V*.

A. B. PECK.

**War-time mineral activities in Washington.** EDSON S. BASTIN. *Econ. Geol.* 13, 524-37(1918).—An outline of what has been done by the Joint Information Board on Minerals and Derivatives in regard to problems of available supplies, domestic and foreign reserves, requirements, price and cost of production, uses, and consumption.

A. B. PECK.

**Mineral resources of Alaska. Report on progress of investigations in 1916.** ALFRED H. BROOKS, *et al.* U. S. Geol. Survey, *Bull.* 662, 458 pp.(1918).—This volume, the 13th of a series of annual bulletins treating of the mining industry of Alaska, contains, beside the administrative report and general review by A. H. BROOKS, papers by H. M. EAKIN (2), B. L. JOHNSON (2), J. B. MERTIE, JR. (4), THEODORE CHAPIN, G. H. CANFIELD, F. H. MOFFIT, S. R. CAPPS, G. L. HARRINGTON, R. M. OVERBECK, and A. G. MADDREN one each. *Au*, *Ag*, *Cu*, *Sn*, *Sb*, *Pb*, and coal mining operations are described, also the developments or prospects for *Pt*, *W*, petroleum, marble, gypsum, and water powers.

L. W. RIGGS.

**Manganese deposits in Madison Co., Montana.** J. T. PARDEE. U. S. Geol. Survey, *Bull.* 690-F, 131-43(1918); cf. *C. A.* 12, 1537.—The geographical and geological features of the *Mn* deposits on Wigwam Creek, Cherry Creek and Renova are described. Those on Wigwam Creek appear to be the most extensive and are composed mainly of psilomelane. Manganite is quite common and wad is widely distributed as a brown dust or in soft felt like masses. Analysis of ore selected for shipment gave from 40 to 50% of *Mn*, 1 to 3 of *Fe*, 3 to 4 of *CaO*, and generally less than 2% of *SiO<sub>2</sub>*. Much of the rejected ore apparently contained from 15 to 40% of *Mn*. There is reason to think that additional development will discover additional ore. The deposits near Renova already show several hundred tons of manganiferous *Fe ore* and several thousand tons of *Fe ore*.

L. W. RIGGS.

**Quicksilver deposits of the Phoenix Mts., Arizona.** FRANK C. SCHRADER. U. S. Geol. Survey, *Bull.* 690-D, 95-109(1918).—This deposit, which was discovered in 1916, is located about 10 miles N. E. of Phoenix, and since the discovery of *Hg* several *Cu* prospects have been found in this region. The *Hg* deposits occur in schist belts as cinnabar, metacinnabarite, and as black secondary sulfide of *Hg*. In one prospect a

few globules of native Hg were found. Five mines or prospects are described, three of which have workable ore averaging 3% or more of Hg. L. W. RIGGS.

**Salt Creek oil field, Wyoming.** CARROLL H. WEGEMANN. U. S. Geol. Survey, *Bull.* 670, 49 pp., 7 plates (1918).—The Salt Creek oil field produces daily 10,000 barrels of high-grade paraffin oil. The history of the development and geology of the region are given in detail. Analyses of 2 samples of the oil show 20% distg. below 150°; 31.5 and 47.0, resp., between 150 and 300°; and about 8% of paraffin. Analyses of 9 samples of water in the oil sands show from 3356 to 12554 parts of total solids per million, the lower figures being due to a diln. by surface water. Estimates of future production are given. L. W. RIGGS.

**Petroleum in Japan.** J. MORGAN CLEMENTS. *Econ. Geol.* 13, 512-23 (1918).—Includes a review of the history of the development of the oil fields. There are five districts in Japan proper and one in Formosa. All the oil is found in Tertiary sediments and except in one case they are along the sea coast. There are some flowing wells and one small gusher has been reported. Only one field produces gas in quantity. The oils vary somewhat in different places in the same district and in the different sands of the same field. They are usually heavy, the lighter ones generally being found in the lower horizons. Many statistics of operation and production are included. A. B. PECK.

**The highland border rocks of the Aberfoyle district.** T. J. JERU AND ROBERT CAMPBELL. *Trans. Royal Soc. Edinburgh* 52, I, 175-212 (1918).—A review of previous work and general account of the stratigraphy of the rocks. J. H. B.

**Spotted lakes of epsomite in Washington and British Columbia.** OLAF P. JENKINS. Wash. State Coll. *Am. J. Sci.* 46, 638-44 (1918).—On Kruger Mountain within a few miles of each other are two lakes (one on each side of the international boundary) from which large amts. of natural Epsom salts have been mined and shipped. Photographs of the lakes suggest a snow covered field with dark areas, more or less circular and occupying about half the total area. The dark spots are shallow pools of brine, immediately beneath which are solid rock-like masses of epsomite. The areas between the spots are white and consist of efflorescent salts resting on a foul black mud. During the rainy season the rise of water in the lakes causes the spotted appearance to disappear. The smaller of the lakes is in Washington and contains nearly pure  $MgSO_4$ . The Canadian lake contains  $Na_2SO_4$  along with  $MgSO_4$ . Other lakes in the vicinity show a predominance of  $Na_2SO_4$ . Rocks in the vicinity contain pyrite and pyrrhotite. These may, upon oxidation, have produced sulfates which reacted with Mg and Ca rocks. This view is supported by the fact that between the epsomite and underlying metamorphic rocks is a thin layer of gypsum. Details of mining operations are given; a point of interest is the expansive force with which a satd. soln. of  $MgSO_4$  crystallizes upon a sudden drop in the temp. This was sufficient to split a 3-inch iron pipe from end to end. It was also found that crystallizing salts could not be kept in wooden tanks, as the soln. would work into the cracks and upon crystn. open the joints. Such tanks had to be lined with metal. L. W. RIGGS.

**The "ferrisphere."** A. GUEBHARD. *Compt. rend.* 167, 393-6 (1918).—G. discusses the probable effects of the expansion of Fe at the time of its solidification in the earth's crust upon the constitution of the globe. L. W. RIGGS.

**Bibliography of North American Geology for 1917 with subject index.** JOHN M. NICKLES. U. S. Geol. Survey, *Bull.* 684, 154 pp. (1918); cf. *C. A.* 12, 1447.—The papers listed number 1194, many of which are of chem. interest. These papers give 243 chem. analyses not included in the list of H. S. Washington (*C. A.* 12, 798).

L. W. RIGGS.

The formation of certain rock-forming minerals in and about glass furnaces (WILSON) 19. Santo Tomas cannel coal, Webb Co., Texas (ASHLEY) 21. Artificial coloration of spherulites with helicoidal development (GAUBERT) 2.

BUTLER, GURDON M.: *Handbook of Mineralogy, Blowpipe Analysis, and Geometrical Crystallography*. Each volume also issued separately. New York: John Wiley & Sons. 546 pp. \$3.50.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

*Metallurgical practice on cinnabar at Idria, Austria*. ROLAND STERNER-RAINER. *Chem. Met. Eng.* 19, 721-7(1918); cf. *C. A.* 9, 191. E. H.

Silver, copper, lead and zinc in the Central States in 1917. J. P. DUNLOP AND B. S. BUTLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 73-130 (preprint No. 8, published Oct. 24, 1918). E. H.

Gold, silver, copper and lead in Alaska in 1917. G. C. MARTIN. U. S. Geol. Survey, *Mineral Resources of the U. S., 1917*, Pt. I, 131-45 (preprint No. 9, published Nov. 21, 1918). E. J. C.

A few notes on Bosh tuyères. J. HOLLINGS. *Trans. Iron Steel Inst.*, Sept. 1918 (advance copy), 9 pp.—The practice of using one or more bosh tuyères, temporarily installed, to rid a furnace of an obstinate scaffold dates back many years. Originally designed to meet emergencies only, bosh tuyères which are used continuously have become quite common practice in Germany and France, especially during the last few years. They first saw continuous service in France in 1907. They appear to be used mainly on furnaces making basic iron and more particularly when the slag is high in alumina. If it were possible to obtain ideal conditions in every-day blast-furnace practice, bosh tuyères would probably be neither necessary nor desirable; and if a furnace were correctly designed for a given output and burden, and regularly so driven, they would seldom be required. However, at the present time there is always the temptation to get more out of a furnace than it was designed for. H. describes in detail the installation of bosh tuyères on a 48 ft. furnace at Brymbo. The increased output due to the use of bosh tuyères was approx. 20%. The coke consumption was slightly increased, although this has not exceeded 0.5 cwt. per ton of pig iron. In this particular case 4 bosh tuyères, 4 in. internal diameter, were inserted at a height of 9 ft. 4 in. above the center line of the hearth tuyères. Each bosh is surrounded with a cooler and rigged in the same manner as the ordinary hearth tuyères. The nose of the tuyère was not more than 3 in. beyond the brickwork of the bosh, which consisted of a complete rivetted steel plate sheeting, lined with 13.5 in. brickwork. A table is given showing the no., size, and position of bosh tuyères for a number of different installations. A. L. FIELD.

Further experiments on spontaneous generation of heat in recently hardened steel. C. F. BRUSH, R. A. HADFIELD AND S. A. MAIN. *Proc. Roy. Soc. London (A)* 95, 120-38 (1918); cf. *C. A.* 11, 2878.—The rate of heat evolution and the rate of contraction of quenched steel, after a short initial period has elapsed, is approximately inversely proportional to the time which has elapsed after quenching. This indicates that contraction is closely associated with the heat evolution and that both phenomena are due to the same cause. E. E. RICHARDSON.

Physical tests of rolled shell steel. J. J. MAHON. *Iron Age* 102, 1082-3(1918).—Rolling or forging directly after prolonged heating produces a weakness in steel,

due to the pptn. of ferrite. This weakness may be eliminated by a double rolling operation, consisting of first breaking down the ingots into blooms and reheating before the final rolling. As an intermediate step, it is necessary to cool the billets to a point where no color is visible. Physical tests on steel which has undergone such treatment shows that it accomplishes an increase of 22% in the yield point, of 5.9% in the ultimate tensile strength, a decrease of 5.5% in the elongation percent and an increase of 15% in percentage of yield to elongation percent.

E. E. RICHARDSON.

**Internal strains developed in metals and alloys as a result of rapid cooling.** A. PORREVIN. *Compt. rend.* 167, 531-3(1918).—The internal strain of a metal can be measured by the shape of thin turnings and by accurately measuring the dimensions of the remaining solid. Cylinders, both solid and hollow, of various dimensions and composed of Cu, Ni, brass, ordinary steel or special steel were studied. By rapid cooling from temps. below the critical points, there is developed a longitudinal compression on the external portions and a longitudinal extension at the interior. The extent of the change produced varies with different metals and with pieces of different dimensions. After annealing operations it is desirable in some cases to cool slowly but with certain steels brittleness is produced by slow cooling.

W. T. H.

**The copper-base bearing metals.** G. H. CLAMER. *Chem. Met. Eng.* 19, 656-7 (1918).—A review of the use of Pb in Cu-base bearing metals (cf. *J. Franklin Inst.* 156, 495(1903); *C. A.* 1, 2793; 9, 3211). Alloys have been made carrying as high as 30% Pb with 3% Sn and 2% Sb; also alloys of 65 Cu, 30 Pb, 2 Sn, and 3 Sb; also with the 5% Sn replaced entirely with Sb. Car bearings  $4\frac{1}{4} \times 8$  in. size made from the same pattern and subjected to a breaking stress applied longitudinally at the middle of the back of the bearing and throughout its entire length, broke at the following av. loads: with 2% Sb substitution, 60,000 lbs.; with 3% Sb substitution, 62,000 lbs.; with total substitution, 52,000 lbs.; as compared with a breaking load of 67,000 lbs. for the alloy of Cu 65, Sn 5, Pb 30. The castings produced with each of the 3 above mentioned alloys are not so satisfactory as those made with the straight Sn alloys, being more or less rough, and showing slight globules of Pb on the surface. The hardening effect of Sb is obtained with the sacrifice of ductility. A certain amt. of Ni can be used for replacing Sn with very satisfactory results. The castings produced when Zn is substituted for a certain amt. of Sn are decidedly unsatisfactory. The substitution of Al for Sn is entirely impractical, and such castings are worthless. The substitution of any other metals for Sn in the Cu-Sn-Pb alloys can be made only by sacrificing the quality of the alloy. A bearing metal should possess the following properties: (1) It should be sufficiently rigid to support the load or resist the impact, but yet not so brittle that it will easily crack. (2) It should have as great a yielding or plastic nature as is consistent with its ability to support the load or resist the impact without deformation of the bearing as a whole. (3) The ideal structure combines a hard matrix to support the load and a softer metal or alloy contained within such matrix, to permit the bearing surface to adjust itself to irregularities of surface. (4) It should be easy to handle in the foundry and machine shop. (5) It should be capable of being remelted without deterioration. (6) For use in babbitt-lined bearings, it should be capable of being tinned, so that the babbitt can be applied thereto. (7) It should have good heat cond. in order to dissipate the heat generated by friction.

F. W. SMITHER.

**Solder, its use and abuse.** M. L. LISSBERGER. *Chem. Met. Eng.* 19, 658-9 (1918).—A brief account of the properties of Pb and Sn alloys and the procedure of manufacturing com. solders. L. divides solder into 2 classes (a) that which is used strictly for soldering purposes, or the jointing and holding together of pieces of metal,

and (b) that which is used primarily for filling, in which the joining is a secondary consideration. The greatest abuse of solder is in the use of high-Sn mixts. for these filling metals. A mixt. of 25% Sn and 75% Pb worked at the proper heat and with proper fluxing is high enough for any filling purpose. The best means of conserving solder in can making is to deepen all baths whether on line machinery or for hand dipping. Overheating of the baths should be avoided and the top of all baths covered with a protecting material, *e. g.*,  $\text{NH}_4\text{Cl}$ , oil, charcoal or ash. There is a great waste of Sn in the failure of many plants to save their dross. A mixt. of 46 parts Sn, 54 parts Pb and 0.5 part Sb makes the strongest solder, though for machine work, as low as 38% Sn has given satisfaction. The substitution of Cd for Sn produces a defective solder. Also in *Bull. Am. Inst. Mining Eng.* 1918, 1759-64. F. W. SMITHER.

**Conservation of tin.** Bureau of Standards investigations. G. K. BURGESS AND R. W. WOODWARD. *Chem. Met. Eng.* 19, 660-2 (1918).—The Sn content of nearly all bearing metals can be reduced to some extent, and in some cases actually eliminated without prejudice to the service rendered. A babbitt metal containing 84 Sn, 9 Sb and 7 Cu appears to be as satisfactory in service as one containing 89 Sn, 7.5 Sb, 3.5 Cu, or 91 Sn, 4.5 Sb, and 4.5 Cu. The latter 2 compns. are more fluid in the molten condition than the first named and consequently the lining can be made in a thinner shell with these babbitts and the total amt. of Sn consumed may be less than if the S. A. E. No. 24 were used. If the design of the bearing is not altered to admit of the thinner shell, the lower compn. babbitt should be used in general. The following compns. are also recommended for use where a high grade of lining is required and when a genuine babbitt is often now used: No. 1, Sn 65, Cu 3 to 6, Zn 28 to 30; No. 2, Sn 62, Cu 4, Zn 33, Al, 1; No. 3, Sn 8, Sb 8, Cu 4, Pb 80; No. 4, Sn 5, Sb 7, Cu 2, Zn 76, Pb 10; No. 5, Sn 10, Sb 12.5, Cu 0.5, Pb 77; No. 6, Sn 21.3, Cu 3, Zn 63.3, Pb 12. Nos. 3 and 4 have been found to do the service required of Sn base linings in machine tool bearings; No. 5 can be used on similar bearings where a greater strain is met. No. 6 is in use in Germany as a "best" babbitt to conserve both Sn and Cu. The use of the compn. 87 Pb and 13 Sb for linings on railroad truck journals might be made more universal. Another type of lining metal which deserves serious consideration is one composed almost entirely of Pb with small additions of alkali or alkali earth metal. Certain of these have been given service tests at the Bureau and in many respects were found equal to or superior to genuine babbitt (a table is given showing a summary of these tests and similar tests on a babbitt of compn. 89 Sn, 7.5 Sb, 3.5 Cu). Asked to det. if 4 classes of babbitt metal could be adopted ranging in Sn content as follows: A 89%, B 40 to 50%, C 4 to 6.5%, D 0, it seemed impossible to limit some of the classes to a single compn., because of the fact that several compns. of nearly the same Sn content are in general use for different purposes. Thus in the table below No. A1 is used in aircraft engines, No. A3 is used for automobile engines, No. A4 is found in bearings of elec. machinery. It was thought that class B can be entirely dispensed with, as class C or class D will be found to serve the purpose equally as well. There are some grades of babbitt containing about 65% Sn which do not fall into either class A or B, but which are claimed by the mfrs. to equal the high-Sn babbitt in performance. If these claims can be substantiated this babbitt should be considered as a substitute for alloys in class A. Although high-Sn babbitt of class A is included, the Bureau does not recommend the continuance of its use for many bearings in which it is now used. Although alloy D2 will be found satisfactory in many installations where class A has hitherto been used, its inclusion in class D should not give the impression that it is a low-grade babbitt. The following recommended compns. are for use in the existing situation, where the saving of Sn is of prime importance:

| Class. | No. | % Sn.                                               | % Sb. | % Pb. | % Cu. | % Fe<br>max. | % As<br>max. |
|--------|-----|-----------------------------------------------------|-------|-------|-------|--------------|--------------|
| A..... | A1  | 91                                                  | 4.5   | 1.00a | 4.5   | 0.08         | 0.10         |
|        | A2  | 89                                                  | 7.5   | 1.00a | 3.5   | 0.08         | 0.10         |
|        | A3  | 84                                                  | 9     | 1.00a | 7     | 0.08         | 0.10         |
|        | A4  | 83                                                  | 8.5   | 1.00  | 8.5   | 0.08         | 0.10         |
| C..... | C1  | 5                                                   | 10    | 85    | 0.5a  | ..           | 0.20         |
| D..... | D1  | ..                                                  | 13    | 37    | 0.5a  | ..           | 0.25         |
|        | D2  | Pb about 98%, balance alkali or alkali earth metal. |       |       |       |              |              |

a—maximum.

More than traces of impurities other than those listed above will not be allowed; the following variations above or below the specified amt. will be permissible for the desired elements: for not over 5%, a variation of 0.50; for 5 to 10% inclusive, 0.75; for over 10%, 1.00. The following compns. have been suggested as substitutes for phosphor bronze, although it is the authors' opinion that trouble will sometimes be experienced with Nos. 8, 9, and 10, because of the high Pb content: No. 7, Cu 81, Sn 7, Pb 9, Zn 3; No. 8, Cu 79, Sn 5, Pb 15, phosphor Cu 1; No. 9, Cu 74, Sn 5, Pb 20, phosphor Cu 1; No. 10, Cu 64, Sn 5, Pb 25, Sb 5, phosphor Cu 1; No. 11, Sn 8, Pb 15, Zn 1.5-3, Cu remainder; No. 12, Sn 5, Pb 17.5, Zn 5, Cu remainder. *Structural bronzes:* "Government Bronze" (Navy Specification, 46 M6a, Gun Metal) or 88 Cu, 10 Sn, and 2 Zn can be modified to admit of a saving of Sn without impairment of the physical properties sought. A compn. of 88 Cu, 8 Sn, and 4 Zn is equal to or superior to the ordinary Govt. bronze. Al bronze of compn. 90 Al, 10 Cu, can also be substituted for many uses of Govt. bronze, as can also Mn bronze and naval brass. There have also been introduced several Al bronzes containing small amts. of Fe, which can be either cast or wrought, and which are now being used by several former users of Govt. bronze. Some of the properties of these alloys are given in a table. *Cd as Sn substitute in solder:* The Bureau has been developing such a solder, and lab. tests together with manufg. experience so far point to a compn. of 80 Pb, 10 Sn, and 10 Cd as being practical for many of the purposes for which solder is required. This solder has been tried in the manuf. of tin cans, on roofing materials, and for elec. joints with encouraging results in all cases. Before using it for food containers, it will be necessary to det. its toxic properties under various conditions. A test has also been made of it in the manuf. of automobile radiators with most satisfactory results. The tensile strength of the Cd solder is about the same as that of 40-60 solder, but the ductility is approx. twice that of the ordinary solders. The point of complete liquation is only slightly higher than that of the ordinary compn. of solders, while the range of solidification is considerably greater. A table is given showing some of the provisional data on these solders as compared to the Sn-Pb solders. It is thought that the 80-10-10 solder can be sold at a profit at 35 c. per lb.

F. W. SMITHER.

*The tin-plate industry.* M. D. BUCK. *Chem. Met. Eng.* 19, 659-60(1918).—During the first 5 months of 1918, approx. 11,000,000 lbs. per month of pig Sn were consumed in the U. S. Solder, bearing metals, bronzes, etc., used about 5,500,000 lbs.; collapsible tubes a little more than 250,000 lbs.; Sn-foil about 500,000 lbs.; and the tin- and terne-plate industry somewhat less than 5,000,000 lbs. In an effort to reduce this consumption and thus conserve our Sn supplies, the following methods are suggested: (1) Salvage. (2) Substitution of other metals for Sn. (3) Curtailment, for the time being, of certain lines of manuf., not absolutely essential to the prosecution of the war. These methods and their application are briefly discussed, especially their bearing on the canning industry.

F. W. SMITHER.

*Pennsylvania railroad anti-friction and bell metals.* F. M. WARING. *Chem. Md. Eng.* 19, 657-8(1918); *Bull. Am. Inst. Mining Eng.* 1918, 1733-5.—A brief review,

giving the approx. compn. and uses of the non-ferrous alloys in general use on the Pa. R. R. F. W. SMITHER.

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The corrosion of iron and steel with special reference to reinforced concrete (FRIEND) 20.

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BOSWELL, P. G. H., HARWOOD, H. F. AND ELDRIDGE, A. A.: *British Resources of Refractory Sands for Furnace and Foundry Practice*. London: Taylor and Francis. 246 pp. 8s. 6d.

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NOBLE, H.: *Fabrication de l'acier*. 2nd Ed. Paris: H. Dunod et E. Pinat. 632 pp. 25 fr.

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**Ore concentration.** R. B. MARTIN. Can. 187,263, Oct. 29, 1918. Oxide ores are sepd. as oxides by employing in the pulp soln. a sol. sulfide in such a small proportion as will not convert even the surfaces of the oxide ore particles into sulfide in a flotation process with agitation and aeration.

**Concentrating ores.** W. A. SCOTT. Brit. 119,224, Aug. 14, 1918. A method of carrying out a flotation process consists in introducing into an ore pulp a "bubble-modifying" permanent gas, usually in admixt. with air or like inert gas, whereby the concentrates are caused to rise to the surface of the liquid. The "bubble-modifying" gas is preferably a hydrocarbon such as  $C_2H_2$  or  $CH_4$ , or a distn. gas such as lighting gas, and the gas or mixt. of gases may be introduced by mechanical agitation or through a porous medium.

**Concentrating ores.** W. W. WEBSTER. Brit. 119,050, June 14, 1917. In the concn. of Sn and W ores, the finely divided ore, which may be first classified, is subjected to the action of Na or K hydroxide, silicate, carbonate, or phosphate,  $NH_3$ , borax, or silicic acid sol, preferably by being agitated in  $H_2O$  with a small proportion of one or more of the reagents, and then submitted to mechanical sepn., such as on tables or vanners, by panning, or in upward-current classifiers. Lime and soda ash may be used in place of NaOH. In some cases, the reagent may be added to the  $H_2O$  with which the ore is mixed for sepn.

**Treating ores.** G. RIGG. Brit. 119,223, July 15, 1918. ZnS ores are desulfurized by roasting in two stages, the S content being reduced in the first stage to such an extent that fusion and slagging are avoided in the second stage, which is effected by blast roasting, e. g., in the Dwight-Lloyd app. The first stage may be carried out by partial roasting to the required extent, or by partial or complete roasting and mixing the product with unroasted ore. The partially roasted ore may be mixed with a binder such as clay or slime concentrates and  $H_2O$  before treatment by the blast roast. In the blast roast steam or  $H_2O$  vapor may be mixed with the air passed through the ore. In some cases, part or all of the gases from the blast roaster may be passed over one or more hearths of the preliminary roasting furnace so as to increase their content of  $SO_2$ .

**Treating ores.** A. L. PELLERGRIN. Can. 187,620, Nov. 26, 1918.  $PbVO_4$  is sepd. from  $PbMoO_4$  by sulfidizing the latter and submitting the mixt. to flotation. The vanadate and molybdate may be removed from the other Pb minerals by sul-



flotizing the latter and submitting to flotation, then the  $\text{PbVO}_3$  and  $\text{PbMoO}_4$  may be sepd. as above.

**Apparatus for concentrating ores by flotation.** F. GROCH. U. S. 1,281,351, Oct. 15.

**Ore-concentrating (flotation) apparatus.** F. GROCH. U. S. 1,283,159, Oct. 29.

**Gold concentrator.** A. R. MACKIE. Can. 185,636, July 23, 1918.

**Metallurgical furnace.** J. KRALUND. U. S. 1,284,711, Nov. 12. The furnace is especially adapted for prepg. alloys of high m. p. for pressure die casting.

**Zinc retort furnace.** A. JONES. U. S., 1,282,847, Oct. 29.

**Apparatus for filtering solutions from ore residues.** E. E. HOWSON. U. S. 1,284,347, Nov. 12.

**Apparatus for filtering solutions from ore slimes.** O. J. SALISBURY. U. S. 1,283,925, Nov. 5.

**Apparatus and method of operating for treating ore slimes with cyanide or other solutions.** L. C. TRENT and S. W. MUDD. U. S. 1,283,363-4-5, Oct. 29.

**Apparatus for precipitating constituents from solutions obtained from ores.** D. C. WALKER. U. S. 1,281,443, Oct. 15. A cyanide soln. of Au may be continuously passed over Zn shavings in the app.

**Extracting metals from ores.** F. L. ANTISELL. U. S. 1,282,521, Oct. 22. In leaching Cu or other metals from ores, the ore is leached with a soln. satd. with respect to impurities in the ore but capable of dissolving the Cu or other desired metal (e. g., in the case of Cu a soln. containing  $\text{H}_2\text{SO}_4$ ) and a portion of the soln. formed by such leaching is continuously withdrawn to an electrolytic system where the Cu is in part deposited, and the soln. which is depolarized during the electrolysis is returned to the leaching system.

**Recovering metals from ores.** C. L. LARSON. U. S. 1,284,910, Nov. 12. Ore, tailings or other mill or smelting products which contain Pb and may also contain Cu, Ag or Au are leached with strong brine to dissolve the metal values; metals other than Pb are pptd. from the soln. and the Pb is then removed electrolytically. After eliminating accumulated sulfates from the barren brine it may be reused for leaching.

**Extracting platinum from sands.** R. THAYER. U. S. 1,281,878, Oct. 15. Pt or similar metal is recovered from granular siliceous ore by diffusing a 0.5% NaOH soln. through a charge of the ore, heating the wetted mass in a closed receptacle to volatilize the metal and thus effecting its sepn. by distn. U. S. 1,281,879 relates to the recovery of metals from like materials by passing a current of heated Cl gas through the charge, leading the gas current from the charge into a body of  $\text{H}_2\text{O}$  or other liquid to dissolve the compds. formed and volatilized with the gas current and leaching out residual metal compds. from the charge.

**Molybdenum.** J. A. HOLLADAY. U. S. 1,281,961, Oct. 15. A wulfenite concentrate or similar material is smelted to eliminate Pb and produce a sol. molybdate slag, the latter is leached with  $\text{H}_2\text{O}$  or a dil. soln. of  $\text{CaCl}_2$  and Ca molybdate is afterward pptd. from the soln. thus obtained, by adding an excess of  $\text{CaCl}_2$ . The ppt. on smelting gives a Mo which is 97% pure.

**Tungsten.** O. BERTOYA. Brit. 119,117, Oct. 15, 1917.  $\text{WO}_3$  is reduced to metal by the action of H or gas containing over 50% H while passing through a series of externally heated inclined retorts down which the material slides.

**Leaching copper ores.** A. W. HAHN. U. S. 1,282,415, Oct. 22. Several tanks are arranged in series circuit, each containing ore, and an acid leaching soln. is ad-

vanced progressively through the series. The soln. is neutralized in the last tank of the series by contact with the ore in this tank which renders the ferric-Fe content of the soln. permanently insol. in the acid-leaching liquor and the soln., after sepn. of the pptd. Fe compds., is led to an electrolytic cell and, after electrolysis to reduce ferric to ferrous salts, is led back for further use in extn.

**Furnace for producing steel directly from iron ore.** L. T. GROUSELLE. U. S. 1,284,094, Nov. 5. The furnace comprizes reducing and melting chambers which are arranged for the sep. introduction of heating gases into each of the chambers and for the sep. exit of waste gases.

**Steel for poppet-valves.** C. A. PFANSTIEHL. U. S. 1,283,287, Oct. 29. Heads of valves for internal-combustion engines are formed of W-steel and the stems are formed of a steel containing 2-3% Ni which has a coeff. of expansion sufficiently less than that of cast Fe to compensate for the difference in operating temp. between the valve stem and the supporting parts of the engine.

**Apparatus for the melting of iron, steel and other substances not easily reduced to the molten condition.** F. G. C. RINCKER. Can. 187,627, Nov. 26, 1918. A furnace has in combination a chamber for converting liquid hydrocarbons into gas immediately on its entry thereinto, a superheater for the gas, an air heater and a combustion heater with valves for control and means for cleaning.

**Finishing gears or other carbonized steel articles.** J. F. SALLOWS. U. S. 1,282,467, Oct. 22. After gears or other steel or carbonized Fe articles are rough-formed and rough-machined they are deeply carbonized by case-hardening, quenched in oil, annealed in C dust, heated and then allowed to cool in the atm. while still enclosed in the C dust, then machined to produce the desired finish, reboxed in insulating material such as C dust, reheated, and quenched in oil or H<sub>2</sub>O according to the grade of steel which it is desired to produce.

**Smelting ores with carbon.** J. H. GRAY. U. S. 1,283,500, Nov. 5. In smelting ores of Fe or other metals by reduction with C, a blast of pure O is introduced into the charge of ore and C so that the combustion of C under the influence of the blast is practically completed in the immediate neighborhood of the points of admission of the blast and an intense heat is thus generated in a comparatively small space and complete reduction of the ore is accomplished in substantially the same space. Only sufficient charge is maintained above this space to keep it filled.

**Roasting ores containing antimony sulfides.** W. A. INGHAM. U. S. 1,283,782, Nov. 5. A thin layer of ground ore containing Sb sulfides, which also may contain Au, Ag and As is heated in a closed roasting chamber to a temp. sufficient to volatilize the Sb sulfides. The vapors of the latter are led off from the roasting chamber and are oxidized to form Sb oxide.

**Reducing metallic compounds.** H. FOERSTERLING. U. S. 1,283,716, Nov. 5. In the simultaneous production of NaCN and reduction of metal compds., Na vapors are caused to react with the oxide of the metal to be reduced, in the presence of coke and N or similar carbonaceous and nitrogenous materials. The heat generated by the formation of the cyanide renders the reaction practically self-sustaining as regards heat-supply.

**Separating ore values from gang.** W. O. ARZINGER. U. S. 1,282,730, Oct. 29. Values are floated from ores such as those containing graphite by the action of a body of H<sub>2</sub>O and oil or other sepg. liquid into which air or other gas is entrained by the action of jets of liquid impinging upon its surface.

**Treating gold and silver ores with cyanide solutions.** A. A. LOCKWOOD. U. S. 1,283,236, Oct. 29. Pulped ore is agitated in a body of cyaniding soln., and a con-

tinuous current of pulp is led from the agitating vessel to one end of a sep. electrolytic pptg. vessel which contains a series of longitudinally arranged depending electrodes. An elec. current is supplied to the pulp of sufficient density to ppt. the precious metals and the pulp is maintained in suspension in the pptg. vessel by a jet of air and is finally removed from the other end of the vessel, led back to the cyaniding tank and the operation is repeated without filtration or sedimentation. The pat. describes an app. for carrying out the method.

**Reducing tungsten trioxide.** C. A. PFANSTIEHL. U. S. 1,283,286, Oct. 29. A blast of highly heated H is passed over the surface of the  $WO_3$  to be reduced which is at the same time heated just sufficiently to compensate for heat lost by radiation and to supply heat necessary to vaporize the  $H_2O$  produced by the reduction reaction.

**Coating carbon conductors with copper.** S. TROOD. U. S. 1,281,716, Oct. 15. Finely divided C which is intended for use in making dynamo-elec. machine brushes or similar articles are coated with a film of Cu amalgam and the Hg is subsequently removed by applying heat and pressure to the material.

**Plating articles with gold.** F. O. ANDRES. U. S. 1,281,262, Oct. 15. Articles of metal or glass or similar material are treated with a soln. formed of  $AuCl_3$ ,  $K_2CO_3$ , sugar and  $H_2O$  so as to form a film of the soln. on the article and a soln. containing  $AgNO_3$  and Cu nitrate may be then applied to the film to form a toning backing for the Au coating. Heating is not required to form the Au film.

**Starring mixture for antimony smelting.** C. YU WANG. U. S. 1,284,164, Nov. 5. A starring mixt. for use in Sb smelting is formed of Fe sulfide resulting as a by-product in the pptn. process of Sb smelting, mixed with about 80% its wt. of  $K_2CO_3$ .

**"Core-oil" for use with sand in metal-founding.** S. G. LOWE. U. S. 1,283,237, Oct. 29. A mixt. formed of linseed oil 24, rosin 33.6, light petroleum "distillate" 29.8 and kerosene 12.5 parts is used for binding sand to form cores.

**Detinning with chlorine.** W. ZACHARIAS. U. S. 1,283,016, Oct. 29. In detinning tin-scrap with Cl, the temp. within the reacting mass is regulated by adding finely divided Sn in sufficient amt. to maintain the temp. below that at which the Fe will be attacked.

**Case hardening.** A. E. BAMFIELD. Brit. 118,983, Feb. 18, 1918. A mixt. consisting of 50 parts of  $Na_2SiO_3$ , 25 parts of China clay, 18.75 parts of amorphous  $SiO_2$ , and 7.85 parts of silver sand is applied as a protective coating to parts of articles not to be carburized during the case hardening process, and is used also to prevent oxidation of the carburized articles during subsequent annealing.

**Casting rare-earth metals.** ALPHA PRODUCTS CO. Brit. 119,244, Sept. 17, 1918. Ce and similar rare-earth metals and their alloys for tinder lighters, etc., are melted under a protective coating of fused Ba or Na chloride or other salt inert to the metal or in an atm. of H and cast, at a temp. only slightly above the m. p., in a heated mold or one with thin walls and cooled at the ordinary room temp. The  $BaCl_2$  is first melted then an alloy of Ce, La, and Di and possibly small quantities of Er and Th, but with less than 10% of Fe, broken into lumps about 1 in. in diam., is added. When the crucible is half full of molten metal, loose coils of Fe wire 40 or 50 g. in wt. are added until the alloy contains 30% of Fe. The temp. is raised to  $1000^\circ$ , the mass stirred gently and then poured into an Fe mold in halves clamped by angle bars and bolts and having grooves and runner connecting them. It may have its surface dusted or coated with  $MgO$ , rolling scale, or Sn plating. If the crude metal is very impure or non-homogeneous it may first be fused under purifying salt such as  $BaCl_2$  and then cast into bars to be broken up, or the salt may be removed and fresh dehydrated salt added. Cu or Mg may be added to the alloy to increase the heat of the spark.

**Mold for casting metals.** M. SMITH. U. S. 1,281,679, Oct. 15. Molds for casting light metal articles with fine details are formed of a mixt. of plaster of Paris 40, asbestos fibers 30 and brick dust 30 parts.

**Welding composition.** C. C. ROBERTS. U. S. 1,283,909, Nov. 5. A mixt. for use in welding Fe, steel or other metals is formed of finely divided Fe 20, sand 50, glass 5, cryolite 10 and calcined borax 15 parts.

**Welding and brazing.** E. H. JONES. Brit. 119,096, Sept. 21, 1917. Metals are united by fusion under the heat of an oxyacetylene or other blowpipe, or cutting tools and dies are coated with metals or alloys such as high-speed steel, by employing metal rods, tubes, etc., which are electroplated with other metals, or are made so as to enclose other metals or alloys, or may have both these features in combination. In the case of Fe or steel, the surface of the rod or tube may be case-hardened to provide an additional amt. of C.

**Desiccating air for use in blast-furnaces.** L. GOLDMERSTEIN (name now judicially changed to L. Cammen). U. S. 1,282,686, Oct. 22. The air is passed through a flowing soln. of  $\text{CaCl}_2$ , maintained nearly satd., at a temp. of about  $-9^\circ$ , in a circulating system, in one portion of which absorbed moisture is removed from the soln. before its return for further use.

**Zinc alloy.** F. S. HODSON. Brit. 119,486, July 16, 1917. An alloy contains Zn 80-85, Al 14-19, Cu 1-2%. An alloy of the Cu and Al is preferably made first,  $\text{H}_2\text{O}$ -quenched, and remelted with the Zn. The final alloy is  $\text{H}_2\text{O}$ -quenched. According to the provisional specification, the alloy may contain also Mg. Cf. C. A. 12, 2080.

**Refining alloys of lead, tin, copper or antimony.** F. A. STIEF. U. S. 1,283,427, Oct. 29. Alloys of Pb, Sn, Cu or Sb, containing As, are heated to redness in contact with Fe and C and the speiss is sepd. from the molten metal by gravity.

**Gold alloy.** G. H. DUFOUR. U. S. 1,282,055, Oct. 22. An alloy for making jewelry is formed of Au 74, Pt 4.5 and Pd 21.5%. It is similar to Pt in appearance and other physical properties.

**Alloy of gold, silver and palladium.** W. E. MOWREY. U. S. 1,283,264, Oct. 29. An alloy of Pd 15, Ag 35 and Au 50 parts is made, for use in dental, electrical and jewelry work, as a substitute for Pt.

**Ferrosilicon.** J. E. JOHNSON, JR. U. S. reissue 14,547, Nov. 12. See original pat. 1,231,260; C. A. 11, 2322.

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## 10. ORGANIC CHEMISTRY.

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CHAS. A. ROUILLER.

**Rudolph Nietzki 1847-1917.** E. NOELTING. *Helvetica Chim. Acta* 1, 343-430 (1918).—Biographical with a review of Nietzki's work on aniline black, the quinones, azo compds., safranines, oxazines, thiazines, azines, fluoridines, ethers of fluorescein and of phenolphthalein, isopurpuric acid, tetraminobenzenes, nitraminosulfonic acids and naphthalene derivs. E. H.

**Organic chemistry in relation to industry.** M. D. FORSTER. *Color Trade J.* 3, 400-5 (1918); cf. C. A. 12, 1885. E. H.

**Synthesis of acetic acid and alcohol by means of acetylene.** GUY CHAZEL. *Rev. produits chim.* 21, 194-5, 210-1 (1918).—To form  $\text{AcOH}$  or  $\text{EtOH}$  from  $\text{C}_2\text{H}_2$  it is necessary to pass through  $\text{AcH}$ , which is now made by the method of Grüstain which consists of passing  $\text{C}_2\text{H}_2$  into a 15-30% soln. of  $\text{H}_2\text{SO}_4$  containing a Hg salt in soln. and

mechanically agitated. Details are given for carrying out this method. The yield is good but some difficulties are encountered: necessity for costly agitation, obstructing action of the air upon the absorption of the  $C_2H_2$ , polymerization of the aldehyde, and necessity for regenerating the Hg. Most of these difficulties are avoided by using the process of H. Dreyfus in which a strong AcOH is substituted for dil.  $H_2SO_4$ . No agitation is needed in this method, and furthermore the subsequent oxidation of the AcH to AcOH can be effected in the one operation. If it is desired to carry on the oxidation in a separate chamber, this is best done by the method of Behrens, who passes  $O_2$  into the aldehyde containing 1% of CeO as a catalyst. This method involves some danger of explosion, which is avoided by substituting 0.5%  $Mn(OAc)_2$  for the CeO. To convert the MeCHO into EtOH the method of Sabatier is used; in this the aldehyde and  $H_2$  are passed through a tube containing reduced Ni and heated to  $140^\circ$ . The various methods are described in detail.

R. N. HARGER.

**Electrolytic oxidation of benzene.** CHAVEAU CLAUDIUS. *Rev. produits chim.* 21, 219(1918).—Upon trying out the oxidation of PhH and subsequent reduction of the quinone to quinol, according to the method of Kempf (Frld. 1900) the author was successful with only the second step. He found that by adding a little  $PbO_2$  to the anode mixt. the oxidation was much accelerated. Detailed instructions are given for the modified process.

R. N. HARGER.

**The manufacture of methylene blue.** BILE. *Rev. produits chim.* 21, 195(1918).—Details are given for carrying out the manuf. of methylene blue according to the method of Bernthsen. The article includes equations explaining the reaction.

R. N. H.

**The pungent principles of ginger.** II. HIROSHI NOMURA. *Sci. Rep. Tohoku Imp. Univ.* 7, 67-77(1918); cf. C. A. 11, 2662.—After zingerone was removed by the method employed in the previous work, the  $Et_2O$  soln. was washed with  $Na_2CO_3$  and then with  $H_2O$  and evapd. The residual oil was fractionated under 21 mm. and the more pungent fraction again fractionated under 0.5-0.6 mm. and the process again repeated under 0.4-0.5 mm., the material from the last fractionation coming over at  $165-202^\circ$ , the major portion at  $175-85^\circ$ . A portion of the  $175-85^\circ$  fraction was analyzed and the remainder fractionated into 3 parts:  $174-9^\circ$ ,  $179-86^\circ$  and  $186-9^\circ$  and each of these fractions analyzed. The results from the four analyses were practically identical, which showed that there was difficulty in keeping a constant vacuum, or else that the material consisted of a mixt. of isomers. The mol. wt. in freezing PhH was 262. From these results N. ascribes to the oil the formula  $C_{17}H_{34}O_2$  and gives it the name *shogaol* from "shoga," the Japanese word for ginger. Shogaol is an oil of pale straw color,  $d_{25} 1.0448$ ,  $[\alpha]_D^{25} 1.52407$ , sol. in  $EtOH$ ,  $(C_6H_{11})_2O$ , and  $AcOH$ , gives a green color with  $FeCl_3$ , and reduces  $NH_3-AgNO_3$ . Zeisel's method (*Monatsh.* 6, 989) indicated that the compd. contains one MeO group, and when refluxed with  $AcOH$  and fused  $AcONa$  it yielded an *acetyl derivative* (B)  $C_{19}H_{38}O_4$ , a yellow oil  $b_{p.} 183-8^\circ$ . Both shogaol and (B) rapidly absorbed Br in  $CHCl_3$ , and when excess of Br was added substitution took place as shown by the evolution of HBr. When  $H_2$  was passed into an  $Et_2O$  soln. of shogaol in which Pt black was suspended addition took place giving  $C_{17}H_{36}O_2$ , a pale yellow oil,  $b_{p.} 166-9^\circ$ , which would indicate one double bond. *Methyl shogaol* (C),  $C_{18}H_{36}O_2$ , yellow oil,  $b_{p.} 160-5^\circ$ , was obtained by shaking an alk. soln. of shogaol with  $Me_2SO_4$ . When (C) was heated with alc.  $NH_4OH.HCl$  it yielded an oil containing N which could not be crystd. and since neither shogaol nor (C) would form a bisulfite compd. N. concluded that the third O in shogaol is ketonic. *Ethyl shogaol*, (D)  $C_{19}H_{38}O_3$ , a pale yellow oil,  $b_{p.} 181-6^\circ$ , was formed by refluxing an alc. soln. of shogaol with  $EtI + KOH$ . When (D) was oxidized with alk.  $KMnO_4$  it yielded ethylvanillic acid. From

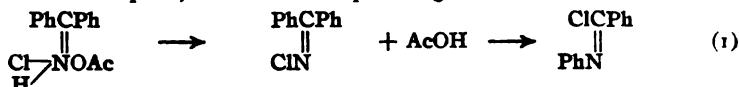
these results N. ascribes to shogaol the formula  $1,2,4\text{-C}_6\text{H}_3(\text{OH})(\text{OMe})(\text{C}_6\text{H}_7\text{CO})$ . In its b. p. shogaol resembles a compd. described by Garnet and Grier (*Pharms. J.* [iv] 25, 118) and a similar one obtained by Nelson (*C. A.* 11, 2333) on distg. gingerol, but its compn. differs from Nelson's compd. R. N. HARGER.

**Synthesis of some phenolic ketones and their tastes.** HIROSHI NOMURA AND FUSATOSCHI NOZAWA. *Sci. Rep. Tôhoku Imp. Univ.* 7, 79-92 (1918).—To det. their pungency and study the conditions influencing the same, various phenolic ketones resembling zingerone (*C. A.* 11, 2662) were synthesized and tasted. The same method of prepn. was used for all: the substituted benzaldehyde was condensed with acetone (acetophenone in the case of (M)) in the presence of caustic soda (Claisen reaction) and the resulting unsatd. compd. reduced with  $\text{H}_2$  in the presence of Pt black. All yields were good except in the case of (H). Piperonal and acetone were condensed giving 3,4-methylenedioxyethyl methyl ketone (A), which was found to m.  $108-9^\circ$  instead of  $96.5^\circ$  as found by Rousset (*Bull. soc. chim.* [3] 13, 348) or  $107^\circ$  as reported by Haber (*Ber.* 24, 618). (A) upon reduction gave 3,4-methylenedioxyphenylethyl methyl ketone, (B),  $\text{CH}_3\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{Ac}$ , a colorless oil, b.  $175.5^\circ$ , which upon long standing solidified and m.  $50-1^\circ$  (cf. *C. A.* 10, 2719). By reducing  $p\text{-MeCOCH:CHC}_6\text{H}_4\text{OMe}$  the authors obtained  $p\text{-MeCOCH}_2\text{CH}_2\text{C}_6\text{H}_4\text{OMe}$  (C). When (C) was boiled with glacial AcOH and concd. HBr the Me group was split off yielding  $p\text{-hydroxyphenylethyl methyl ketone}$ ,  $\text{HOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{COMe}$  (D), colorless needles, m.  $82-3^\circ$ , sol. in  $\text{Et}_2\text{O}$ , EtOH and in cold ligroin, and giving a green soln. with  $\text{FeCl}_3$ . (D) was also prepd. by reducing  $p\text{-HOC}_6\text{H}_4\text{CH:CHCOMe}$ . By reducing  $\text{PhCH:CHCOMe}$  (E) the authors obtained  $\text{PhCH}_2\text{CH}_2\text{COMe}$  (F), b.  $231.5-3.0^\circ$  and not  $235-6^\circ$  as found by Harries and Eschenbach (*Ber.* 29, 383). The *o*-compd. (G) corresponding to (D) was prepd. in a similar manner. *m*-Hydroxystyryl methyl ketone (H),  $\text{HOC}_6\text{H}_4\text{CH:CH:COMe}$ , colorless needles, m.  $97-8^\circ$ , upon reduction gave *m*-hydroxyphenylethyl methyl ketone,  $\text{HOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{COMe}$ , colorless crystals, m.  $85-6^\circ$ . The condensation of *o*-vanillin and acetone yielded 2-hydroxy-3-methoxystyryl methyl ketone (I),  $2,3\text{-HO(MeO)C}_6\text{H}_3\text{CH:CHCOMe}$ , yellow crystals from dil. EtOH m.  $77-77.5^\circ$ . When (I) was heated above its m. p. it lost 8.32% in wt. and yielded the corresponding monohydrate (J), yellow crystals, m.  $81-2^\circ$ . That (J) is a hydrate was shown by the fact that it gave 2.78 active H atoms by Zerewitinoff's method (*Ber.* 40, 2028), is readily reduced by  $\text{H}_2$  in the presence of Pt black, and when recrystd. from PhH it yielded (I). Upon reduction both (I) and (J) gave 2-hydroxy-3-methoxyphenylethyl methyl ketone (K),  $2,3\text{-HO(MeO)C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{COMe}$ , a clear oil, b.  $206-7^\circ$ , which turned brown upon standing. Acetophenone was condensed with vanillin and a mixt. of two products resulted which were sepd. by treatment with 2% NaOH, the insol. portion being vanillalacetophenone,  $4,3\text{-HO(MeO)C}_6\text{H}_3\text{CH}(\text{CH}_2\text{Bz})_2$ , colorless crystals, m.  $121-2^\circ$ , mol. wt. 370-83 in boiling PhH, not reduced by  $\text{H}_2$  in the presence of Pt black, benzoyl derivative, m.  $133^\circ$ ; while the portion sol. in 2% NaOH was vanillalacetophenone,  $\text{PhCOCH:CHC}_6\text{H}_3(\text{OMe})\text{OH}$ , yellow crystals, m.  $92-3^\circ$ . (L) upon reduction gave 4-hydroxy-3-methoxyphenylethyl phenyl ketone,  $\text{PhCOCH}_2\text{CH}_2\text{C}_6\text{H}_3(\text{OMe})\text{OH}$ , (M), colorless scales, m.  $97.5-8.0^\circ$ . With the exception of (E), the reduction of all the unsatd. compds. increased the soly. in org. solvents, and also the pungency, which in the case of the unsatd. compds. was developed on the tongue only after some time. (E), however, was rather sol. in org. solvents and had a pungent taste. (F), (B) and (D) were all pungent, which would indicate that a free phenolic OH group is unnecessary to pungency, although the position of the free OH-group has an important influence upon the taste, since the taste of (G) resembled that of (K), while (D) and (M) had similar tastes. The pungency of (G) and (D) was less than that of (K) or (M), indicating that a MeO group in the *m*-position increases the pungency. The taste of (M) was

very similar to that of zingerone and, since they differ only in the side chain, N. and N. conclude that the influence of the side chain is less than that of the various substitutions in the PhH ring.

R. N. HARGER.

**The Beckmann rearrangement.** VIII. MITSURU KUHARA, MAOMICHI AGATSUMA AND KIUKICHI ARAKI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 3, No. 1, 1-16(1917); cf. *C. A.* 11, 579-80.—When  $\text{Ph}_2\text{C:NOAc}$  and dehydrated  $\text{PhSO}_3\text{H}$  were heated to fusion a violent reaction took place evolving  $\text{AcOH}$  and the residue was probably  $\text{PhC(OSO}_2\text{Ph):NPh}$  as shown by the fact that it yielded  $\text{PhCONHPh}$  upon the addition of water. This would seem to indicate that the substitution of the  $\text{Ac}$  group by a group of greater acidity permits the reaction to take place and the authors believe that the occurrence of a reaction of this type explains why the addition of  $\text{HCl}$  to  $\text{Ph}_2\text{C:NOAc}$  causes rearrangement to take place, an additive compd. being first formed:

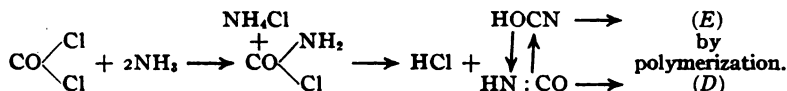


*Diphenyl ketoxime hydrochloride*,  $\text{Ph}_2\text{C:NOH.HCl}$  (A), produced by passing dry  $\text{HCl}$  into  $\text{Ph}_2\text{C:NOH}$ , white crystals, fused at  $128^\circ$  and upon further heating at the same temp. colored yellow with the evolution of  $\text{HCl}$ , and then became suddenly cryst. under violent reaction. The product was  $\text{PhCONHPh}$ . The reaction was also produced at  $125^\circ$  by passing  $\text{HCl}$  into the melted oxime, a 95% yield of  $\text{PhCONHPh}$  being obtained, while the same rearrangement of the hydrochloride was produced by dehydrating agents,  $\text{ZnCl}_2$  causing the reaction to begin at  $70^\circ$  and to run almost to completion at  $90^\circ$ , while  $\text{CCl}_4\text{CHO}$  caused a 91% rearrangement when heated with the hydrochloride at  $90^\circ$  for 10 minutes and practically complete rearrangement when the mixt. was kept at  $25^\circ$  for 2 days. The hydrochloride of  $\text{Ph}_2\text{C:NOAc}$  when heated above its m. p. did not rearrange but split off  $\text{MeCl}$ . When  $\text{Ph}_2\text{C:NCl}$  (C) was fused with  $\text{KOH}$  a violent reaction took place, evolving considerable  $\text{MeCOPh}$  and some  $\text{PhNH}_2$ , while  $\text{Ph}_2\text{C:NH.HCl}$ ,  $\text{Ph}_2\text{C:NOH}$  and  $\text{Ph}_2\text{C:NOAc}$  under similar treatment gave no  $\text{PhNH}_2$ . Since heat or dehydrating agents caused rearrangement in the case of (A), the authors write the equation similar to (1),  $\text{H}_2\text{O}$  instead of  $\text{AcOH}$  being split off. The fact that (C) has previously resisted all attempts to cause it to rearrange and only rearranges when fused with  $\text{KOH}$ , is explained by assuming that its  $\text{Cl}$ , which is derived from  $\text{PCl}_5$ , is positive and changes to negative "under the influence of the alkali." The *dibenzyl ketoxime, benzenesulfonate*  $(\text{PhCH}_2)_2\text{C:NOSO}_2\text{Ph}$ , colorless crystals, m.  $64^\circ$ , sol. in  $\text{EtOH}$ ,  $\text{PhH}$  and  $\text{CHCl}_3$ , was prepd. from  $(\text{PhCH}_2)_2\text{C:NOH}$  and  $\text{PhSO}_3\text{Cl}$ . When heated to  $74^\circ$  it reacted with explosive violence, giving a yellow viscid product, which upon being added to  $\text{H}_2\text{O}$  yielded  $\text{PhSO}_3\text{H}$  and *benzylphenylacetamide*,  $\text{PhCH}_2\text{CONHCH}_2\text{Ph}$ , colorless scales, m.  $118-9^\circ$ . *Diphenyl ketoxime m-nitrobenzenesulfonate*,  $\text{Ph}_2\text{C:NOSO}_2\text{C}_6\text{H}_4\text{NO}_2$ , m.  $24^\circ$ , upon being melted suffered spontaneous rearrangement yielding a yellow liquid, which when treated with  $\text{H}_2\text{O}$  gave  $\text{PhCONHPh}$  and  $m\text{-NO}_2\text{C}_6\text{H}_4\text{SO}_3\text{OH}$ . Two other esters of  $(\text{PhCH}_2)_2\text{C:NOH}$ , the *acetyl ester*, m.  $33-4^\circ$ , and the *benzoyl ester*, m.  $60.5^\circ$ , were prepd. but did not show rearrangement upon being heated. When  $\text{Me}_2\text{C:NOSO}_2\text{Ph}$  was heated to  $130^\circ$  a reaction occurred and the product, treated with alkali, liberated  $\text{MeNH}_2$ , but the authors were unable to isolate  $\text{AcNHMe}$ .  $\text{Me}_2\text{C:NOCOCH}_2\text{Cl}$  suffered rearrangement when heated to  $195^\circ$  and from the product  $\text{AcNHMe}$  was isolated. Since results in this and previous work show that the rearrangement of the same acyl ester of different ketoximes takes place at different temps., the hydrocarbon radical must exert an influence upon the rearrangement (both the hydrocarbon exchanging places and the one opposite); and since the different acyl esters of the same ketoxime rearrange at widely different temps., the acyl group too must exert a strong influence, and as a con-

sequence "the most conceivable assumption is that the exchange of radicals would be simultaneous."

R. N. HARGER.

**Constitution of carbamides. VII. Mechanism of the synthesis of urea from the interaction of carbonyl chloride and ammonia.** EMIL ALPHONSE WERNER. Trinity Coll., Dublin. *J. Chem. Soc.* 113, 694-9(1918).—This reaction is not a simple one, such as the interaction of  $\text{AcCl}$  and  $\text{NH}_3$ , and it is now shown that the so-called secondary products indicate the true origin of urea (*A*) as formed from  $\text{COCl}_2$  and  $\text{NH}_3$ . In each of 3 expts. 12 g.  $\text{COCl}_2$  in 400 cc. freshly distd. PhH were placed in a stout, wide-mouthed bottle provided with a cork carrying a delivery tube, thermometer, and exit tube. A slow current of dry  $\text{NH}_3$  was delivered on to the surface of the continually shaken liquid, but as the product was gelatinous, uniformity in the progress of the reaction and const. temp. were not maintained. In expt. I the bottle was immersed in  $\text{H}_2\text{O}$  at  $0^\circ$ , in II in  $\text{H}_2\text{O}$  at  $15^\circ$ , and in III no cooling was used. In I, II, III, resp., the max. temps. reached were  $20-5^\circ$ ,  $40-50^\circ$ ,  $65-70^\circ$ ; (*A*) formed, 31.7, 37.3, 41.2% of the theory; biuret (*B*), 14.4, 10.1, 7.8%; ammeline (*C*) 7.65, 8.6, 10.6%; cyanuric acid (*D*), 3.45, 6.4, 5.98%; cyamelide (*E*), 0.69, trace, none. (*D*) and (*E*) owe their formation to the polymerization of  $\text{HOCN}$ , and since there exists no tendency towards the formation of a compd. containing the system  $:\text{C}(\text{NH}_2)_2$ , (*C. A.* 12, 2193) the true course of the reaction is:

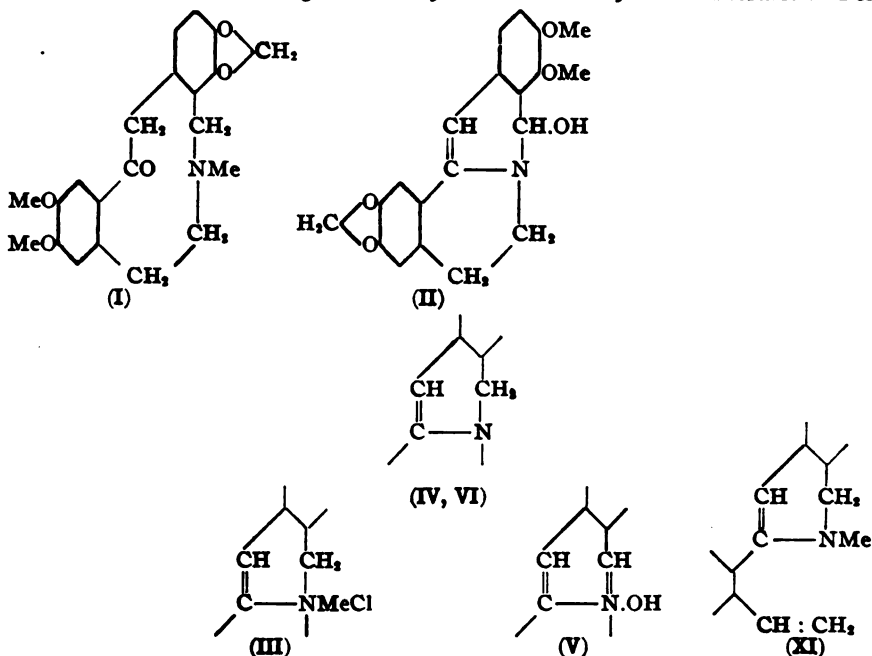


Since  $\text{HOCN}$  is generated in the presence of  $\text{NH}_3$ , the origin of the (*A*) is self-evident, the reaction really being no more than Wöhler's synthesis in another form. It had previously been shown that while (*B*) is formed from  $\text{HOCN}$  and (*A*), (*C*) is formed from  $\text{HOCN}$  and (*B*) (*C. A.* 7, 3315; 8, 1415), and (*B*) was therefore overlooked by previous investigators of the reaction between  $\text{COCl}_2$  and  $\text{NH}_3$  (Regnault, *Ann. chim. phys.* [2] 69, 180(1838); Natanson, *Ann.* 98, 287(1856); Bouchardat, *Compt. rend.* 69, 961(1869); Fenton, *J. Chem. Soc.* 35, 793(1879); Hantzsch and Stuer, *Ber.* 38, 1041, 2326(1905)). The theoretical yields in the above table were calcd. as follows: 1  $\text{COCl}_2$  = 1 mol. each of (*A*), (*D*), and (*E*), since the last are formed by polymerization of  $\text{HOCN}$ ; 2  $\text{COCl}_2$  = 1 mol. (*B*), and 3  $\text{COCl}_2$  = 1 mol. (*C*). The products of the reaction were estimated as follows, using I as example: The solid material was washed with PhH, dried, and extd. with warm alc.; the residue (lost 12.04 g.  $\text{NH}_4\text{Cl}$  on treatment with  $\text{H}_2\text{O}$ ) left 0.436 g. insol. matter, from which 0.4 g. (*C*) was extd. by  $\text{NaOH}$ , leaving 0.036 g. (*E*). The alc. ext., evapd. to small vol., yielded 2.25 g. crystals containing 0.96 g.  $\text{NH}_4\text{Cl}$ , 0.95 g. (*A*), and 0.34 g. of chiefly Et allophanate (*F*) and a trace of (*B*), while the filtrate, evapd. dry, left 2.45 g. residue; this was dissolved in 50 cc.  $\text{H}_2\text{O}$  and (*D*) estimated in an aliquot by titration with 0.1 *N*  $\text{NaOH}$ , with phenolphthalein as indicator, (*A*) by pptn. as nitrate, and (*B*) colorimetrically (*C. A.* 8, 1415). Absence of guanidine was proved by absence of pptn. with picric acid. The proportion of (*D*) was small owing to the unfavorable conditions for the existence of free  $\text{HOCN}$ . "After the crude product from expt. I had been shaken with a small quantity of pure alc. (*F*) (5.3% of the theoretical) was extd. from the PhH-alc. filtrate. This could only have resulted from a reaction with  $\text{HOCN}$  generated from the substance  $\text{H}_2\text{NCOCl}$ , present in the original product, thus:  $2 \text{H}_2\text{NCOCl} + \text{C}_2\text{H}_5\text{OH} \longrightarrow \text{C}_2\text{H}_5\text{O}_2\text{N}_2 + 2 \text{HCl}$ ." While the total Cl of the  $\text{COCl}_2$  was thus accounted for, only about 62% of the CO was recovered, owing to the decompn. of  $\text{COCl}_2$  by  $\text{H}_2\text{O}$  generated in the formation of (*C*). On adding 0.68 g.  $\text{NH}_3$  in 200 cc. PhH to 4 g.  $\text{COCl}_2$  in 100 cc. PhH, washing the ppt. with PhH, drying, and extg. with alc., 4.6% of the theory of (*A*) was found after removal of the  $\text{NH}_4\text{Cl}$ , while the PhH filtrate, shaken with a





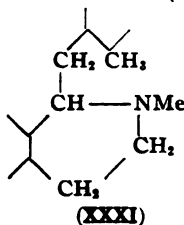
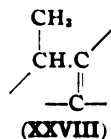
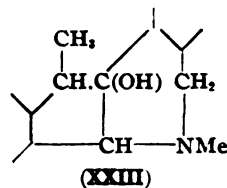
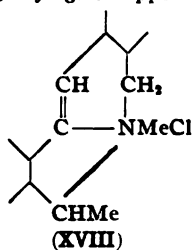
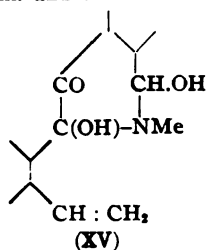
constitution of dihydroanhydroberberine ((VI), using (II) as basis) (*Arch. Pharm.* 243, 35(1905); *C. A.* 5, 1601) are upheld against those of Faltis (*C. A.* 5, 1751), confirmation and additional evidence being obtained by the further study of this substance. For



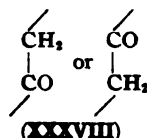
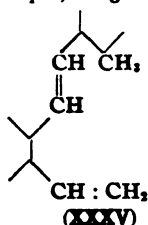
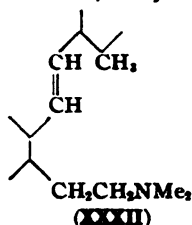
preparative purposes (VI) is best prepd. as follows: 500 g. com. (II).HCl (berberinium chloride (7)) are thoroughly mixed with 700 cc. 30% aq. NaOH in a stout, round-bottomed flask, let stand 0.5 hr., suspended in a large basin of cold H<sub>2</sub>O, and this is heated so that it boils in about 0.5 hr., without stirring. After it is heated 1 hr. longer, with shaking, and let stand overnight the aq. alkali is run off from the solidified material, which is washed by decantation with H<sub>2</sub>O, mixed with excess of dil. HCl, heated on the H<sub>2</sub>O bath, and sucked off, the residue is ground up and the HCl treatment repeated until all base has been extd. and a nearly colorless mass of oxyberberine (8) remains. The exts. are mixed with concd. HCl while still hot; on standing (VI).HCl (9) seps., mixed with unchanged (7). The product is washed with dil. HCl, recrystd. by soln. in the minimum amt. of boiling H<sub>2</sub>O and adding concd. HCl, redissolved in hot H<sub>2</sub>O, and mixed with excess of NH<sub>3</sub>. After the semi-solid mass hardens it is ground up and washed with hot H<sub>2</sub>O until the filtrate is no longer dark (this deposits a deeply colored salt on standing which proved to be (7) containing a small amt. of an undetd. coloring matter), dried on tile, and triturated and washed first with MeOH and then with acetone until a red impurity has been removed; after 2 recrystns. from acetone the (VI) is quite pure. The acetone mother liquors are concd. and the residue worked up as was (9). The (VI) m. 168-70°; a mixt. with tetrahydroanhydroberberine (10) (m. 170°) softened 140-5°, m. 152°, so these cannot be identical, as claimed by F. (*loc. cit.*). In H<sub>2</sub>SO<sub>4</sub> (VI) gives a deep brown color on addition of a trace of dil. HNO<sub>3</sub>; it is unchanged by boiling with dil. HCl, differing from anhydromethylberberine (XI) (see below); contrary to G. (VI) and its salts are not readily oxidized on exposure to air, detailed expts. being given which show that (VI) was unaltered after 6 months, while (9),

which crysts. with 4  $\text{H}_2\text{O}$ , one of which remains at  $90^\circ$ , was only very slightly oxidized during 6 months. (10) may be obtained colorless, m.  $174^\circ$ , by recrystg. its hydrochloride (12) from HOAc until white, then liberating the base and recrystg. from alc. or acetone. Detailed crystallographic measurements of (VI) and (10) are given, affording further proof of their non-identity. Addition of excess of  $\text{Me}_2\text{SO}_4$  to a soln. of (VI) in boiling PhH results in the gradual deposition of *dihydroanhydroberberine methosulfate* (13),  $\text{C}_{28}\text{H}_{31}\text{O}_4\text{N} \cdot \text{Me}_2\text{SO}_4$ , better prepd. by shaking (VI) with 1.5 g.  $\text{Me}_2\text{SO}_4$  until pasty, letting stand 8 days, triturating with PhH, filtering, and recrystg. from MeOH; yellow prisms, sinters  $140^\circ$ , m. about  $205^\circ$ , seps. from  $\text{H}_2\text{O}$  as very voluminous needles with 4  $\text{H}_2\text{O}$ . Crystallographic measurements are given of the orthorhombic crystals from MeOH. The aq. soln. gives no ppt. even on boiling with aq.  $\text{NH}_3$ , but turns milky with hot, concd.  $\text{NaOH}$ , and gives a cryst. ppt. In HOAc it gives a pink color with  $\text{H}_2\text{SO}_4$ , changing through claret to brown with a drop. of dil.  $\text{HNO}_3$ . The PhH washings from the crude (13) and the mother liquors contain the more sol. *dihydroanhydroberberine methyl hydrogen sulfate* (14),  $\text{C}_{28}\text{H}_{31}\text{O}_4\text{N} \cdot \text{MeHSO}_4$ , amber prisms, gives (VI) on addition of  $\text{NH}_3$ . With boiling dil. KI a boiling, dil. soln. of (13) gives the methiodide, identical with that prepd. directly by Freund and Fleischer (C. A. 9, 2872); *methochloride* (13a), prisms with 5  $\text{H}_2\text{O}$ , 4 of which are lost at  $95^\circ$ , m.  $223^\circ$  (decompn.), gives (VI) when heated at  $230^\circ$  for several min., MeCl being eliminated (cf. [1873]). When 5 g. (13) free from (14) are dissolved in the minimum amt. of boiling MeOH, mixed with 30 cc. 25% MeOH-KOH, and boiled vigorously for 10 min. so that much of the MeOH escapes, an oil seps., after which the whole is vigorously shaken under cold  $\text{H}_2\text{O}$ ,  $\text{H}_2\text{O}$  is added, and the ppt. washed with  $\text{H}_2\text{O}$ , then ground and washed with MeOH. The resulting *anhydromethylberberine* (XI), using (II) as basis,  $\text{C}_{21}\text{H}_{21}\text{O}_4\text{N}$ , is rapidly recrystd. from MeOH or acetone, forming pale yellow needles or prisms, m.  $94-5^\circ$ , weakly basic, in HOAc gives a faint yellow-brown color with  $\text{H}_2\text{SO}_4$ , changing rapidly to green, and, on adding a trace of dil.  $\text{HNO}_3$ , cherry-red; with  $\text{PhN}_2\text{Cl}$  in HOAc it gives a deep orange-red color; when boiled with MeOH in the air and the soln. concd. a small yield of what was apparently *trioxanhydromethylberberine* (XV),  $\text{C}_{28}\text{H}_{29}\text{O}_7\text{N}$ , sepd., garnet prisms, m.  $153-5^\circ$ , feebly basic, is decompd. by boiling dil. HCl; in HOAc it becomes deep orange with  $\text{H}_2\text{SO}_4$ , changing to dark brown with a trace of  $\text{HNO}_3$ ; the resinous main product of the action of MeOH on (XI) yielded nothing cryst., this and the failure to isolate cryst. products analogous to the epicryptopines (157) by the action of concd. HCl being the chief points of departure of the properties of (XI) from those of anhydrocryptopine (16) (154). Analogous to this, when reduced in iced dil. HCl or  $\text{H}_2\text{SO}_4$  soln. with Na-Hg it yields N-methylisotetrahydroanhydroberberine (B) Pyman, C. A. 7, 2743; *hydriodide*, needles, darkens  $220^\circ$ , m.  $225^\circ$  (decompn.). 15 g. (XV), shaken with 20 cc.  $\text{Me}_2\text{SO}_4$  and let stand 1 week, gave, on triturating and washing with PhH and recrystg. from  $\text{H}_2\text{O}$ , *anhydromethylberberine methosulfate* (17), leaflets which weather in the air but retain 1  $\text{H}_2\text{O}$  at  $100^\circ$ , m.  $150-2^\circ$  with effervescence; in HOAc it gives a pink color with  $\text{H}_2\text{SO}_4$ , changing through blue to brown with a drop of dil.  $\text{HNO}_3$ ; dissolved in boiling MeOH and heated with MeOH-KOH it gives (XI) *methiodide*, flat prisms, browns  $185^\circ$ , m.  $188-90^\circ$  (decompn.). Like the methosulfate (154) of (16), when 1 g. (17) is boiled 5 min. with 3 cc. concd. HCl and the acid distd. off *in vacuo*, *ψ-methylberberinium chloride* (XVIII),  $\text{C}_{21}\text{H}_{20}\text{O}_4\text{NCl} \cdot \text{H}_2\text{O}$ , is obtained, seps. from  $\text{H}_2\text{O}$  contg. HCl as balls of needles or plates which retain 1  $\text{H}_2\text{O}$  at  $70^\circ$  *in vacuo*, softens  $80-2^\circ$ , sinters, and turns sirupy below  $100^\circ$ ; in HOAc it gradually gives a  $\text{KMnO}_4$  color with  $\text{H}_2\text{SO}_4$ ; a crystal, moistened with concd.  $\text{HNO}_3$ , gives a crimson soln.; an aq. soln. reduces  $\text{KMnO}_4$  instantly at  $0^\circ$  and turns yellow with  $\text{NH}_3$  but when warmed with NaOH the yellow soln. changes

through orange to brown and a greenish base seps.; *chloroplatinate* (19), pale salmon-colored, the filtrate being deep pink, just as in the prepn. of the same salt of  $\psi$ -cryptopine chloride (20) (155). (19) turns yellow 200°, gradually darkens, sinters above 210°, m. 243° (decompn.); *iodide*, almost colorless warts, darkens 160-5°, decomp. 175-80°. Just as dil. HCl acts on (16) to form the hydroxyisoanhydrodihydrocryptopines (A) (21) (156) and (B) (22) (156), (XI) yields the corresponding compds. as follows: 2 g. are mixed with 2.5 cc. concd. HCl and 8 cc. H<sub>2</sub>O and warmed in boiling H<sub>2</sub>O for 20 min. The sirup which seps. on cooling hardens and is dissolved in hot H<sub>2</sub>O, treated with NH<sub>3</sub>, and the ppt. either immediately extd. with Et<sub>2</sub>O from which (XXIII A) (see below) seps. on rapidly drying and cong., or dried on tile and triturated and washed with MeOH, the residue being *hydroxyisoanhydrodihydromethylberberine* (A) (XXIII), C<sub>21</sub>H<sub>22</sub>O<sub>4</sub>N, purified from MeOH, indefinite crusts, m. 210-12°, readily forms supersatd. solns. of sparingly sol. salts with mineral acids; in HOAc gives an orange color with H<sub>2</sub>SO<sub>4</sub>. The MeOH mother liquors from (XXIII A) are dild. with H<sub>2</sub>O and the ppt. is extd. with Et<sub>2</sub>O, which is washed, dried, and fractionally concd., the filtrate from the (XXIII A) obtained by the 1st method being worked up in the same way. By recrystn. from Et<sub>2</sub>O or MeOH these fractions are sepd. into pure (XXIII A) and *hydroxyisoanhydrodihydromethylberberine* (B) (XXIII), prisms, m. 168-70°, does not yield a cryst. hydrochloride. It has now been found possible to obtain a cryst. (21) by the 1st method for the isolation of (XXIII A); nodules, m. 177-80°, seps. from MeOH or acetone on long standing as micro-prisms. When 1 g. (XXIII A or B) is heated 15 min. at 100° with 2 cc. AcCl, the excess evapd. and the residue mixed with cold H<sub>2</sub>O and heated to boiling the viscid *hydrochloride* (24) of what is apparently the *acetyl derivative* (25) of (XXIII A) seps. (24), C<sub>21</sub>H<sub>23</sub>O<sub>4</sub>N.HCl, seps. from MeOH as doubly refracting rhombic plates of angle 78° and showing straight extinction, m. about 253° (decompn.); with NH<sub>3</sub> the hot aq. soln. yields (25), prisms from MeOH, m. 166-7°; the filtrate, on spontaneous evapn. deposits (XXIII A). Treated with NH<sub>3</sub>, the mother liquors and washings of (24) gave a ppt. of what seemed to be the *acetyl derivative* (26) of (XXIII B), nodules from MeOH, m. 213-5°; with warm, dil. HCl it gives the *hydrochloride* (27), rhombic plates of angle 70°, darkens above 220°, decomp. 230°, seps. from hot H<sub>2</sub>O as very characteristic, almost square plates with bevelled edges; the mother liquors from this deposit (24) on concn., interconversion apparently having taken place during the formation of (27). Boiled with 20% H<sub>2</sub>SO<sub>4</sub> for 10 min. and treated with NH<sub>3</sub>, crystg. the ppt. from MeOH, (26) gave (XXIII A),



while the filtrate deposited (XXIII B) on slow evapn. in the ice-box; boiled with 10% MeOH-KOH and the soln. concd. and let stand in the ice-box it gave (XXIII A). *Iso-anhydromethylberberine* (XXVIII),  $C_{21}H_{21}O_4N$ , analogous to isoaanhydrocryptopine (29) (156), may also be prepd. by the action of boiling concd. HCl on (XXIII A or B), but is best prepd. as follows: 2 g. (XXIII) are warmed with 6 cc.  $POCl_3$ , enough heat being evolved on soln. to raise the temp. from  $60^\circ$  to the b. p.; after boiling 10 min. and distg. off the excess  $POCl_3$  *in vacuo* the resulting yellow gum is dissolved in much boiling  $H_2O$ , the hydrochloride (30) of (XXVIII) sepg. on concg. and stirring; prisms, m. about  $205-10^\circ$ ; treated in boiling aq. soln. with  $NH_3$  it forms a milky liquid from which (XXVIII) soon crystals, prisms from MeOH, m.  $123-4^\circ$ ; in HOAc it gives an orange color with  $H_2SO_4$ , changing to brown with dil.  $HNO_3$ ; heated in a test tube it chars and gives a  $Me_2NH$ -like odor; hydriodide, indefinite nodules, discolors about  $215^\circ$ , de-comps. about  $247^\circ$ , is dimorphic, sepg. from alc. as needles and prisms, the former dissolving first on warming. When boiled with a large excess of dil.  $H_2SO_4$  (XXVIII) gives small yields of (XXIII A and B), isolated in the usual way. 30 g. (13a) were dissolved in 1 l. hot  $H_2O$ , mixed with 50 cc. concd. HCl, and heated to boiling in an enamelled basin, adding 1500 g. 3% Na-Hg in 3 portions and enough HCl to keep the reaction strongly acid; on adding  $NH_3$  to the cooled soln., drying the ppt. on porous tile, and extg. with ether, the residue was found to consist of a quaternary chloride, more being obtained from the aq. washings of the crude ppt. above. By repeated crystn. from dil. HCl the salt was sepd. into the  $\alpha$ - and  $\beta$ -methochlorides (stereoisomeric) of tetrahydroanhydroberberine (Pyman, *loc. cit.*). The  $Et_2O$  ext. from the crude quaternary chloride (above) was well washed with  $H_2O$ , dried over  $K_2CO_3$ , and evapd., yielding the sirupy *dihydromethylisotetrahydroanhydroberberine* (XXXI) (cf. Pyman, *loc. cit.*),  $C_{22}H_{25}O_4N$ , whose salts show little tendency to cryst.; *chloroplatinate*, chalky, salmon-colored; *methosulfate*, pptd. as a sirup from PhH soln. by dry  $Et_2O$ , when dissolved in a little MeOH and boiled with excess MeOH-KOH for 15 min., letting most of the MeOH boil away, gave a caseous ppt. on adding  $H_2O$ . When this was extd. with much  $Et_2O$  and this dried and evapd. the resulting sirup gradually crystd. and was purified by soln. in dil. HCl, making alk. with  $NH_3$ , and repeating the process; the resulting *dihydrodimethylisotetrahydroanhydroberberine* (XXXII),  $C_{22}H_{27}O_4N$ , analogous to anhydrotetrahydromethylcryptopine (33) (149), could not be recrystd.; *chloroplatinate*, pale ochreous, *methosulfate* (34), prepd. in PhH soln., needles. When digested on the  $H_2O$  bath with a large excess of 20% MeOH-KOH (34) is readily de-compd. with elimination of  $NMe_3$ . After 20 min., when most of the MeOH is distd. off,  $H_2O$  is added and the caseous ppt. extd. with much  $Et_2O$ ; when this is dried, concd., and let stand, *berberidene* (XXXV),  $C_{20}H_{21}O_4$ , seps., analogous to cryptopidine (36) (151); prisms, m.  $113-4^\circ$ , seps. from MeOH as irregular laminae with lilac fluorescence. 2.3 g. (XXXV) were oxidized in 60 cc. acetone with 4 g. finely sieved  $KMnO_4$ , adding this gradually and keeping the temp. below  $18^\circ$ . The  $MnO_2$  ppt. was filtered off and washed with acetone, this yielding, on evapn., 1.2 g. of a sirup which gradually crystd.



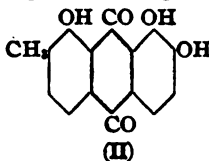
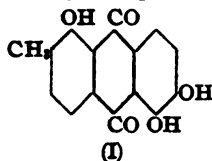
This was distd. with steam and the distillate extd. with  $Et_2O$  and the ext. washed, dried, and evapd., yielding long needles of 2,5,6-(OH)(MeO) $_3C_6H_2Me$  (37) (150).

The portion non-volatile with steam was extd. with  $\text{Et}_2\text{O}$ , this yielding a *ketodihydroberberidine* (XXXVIII)  $\text{C}_{20}\text{H}_{20}\text{O}_5$ , on evapn., allowing to solidify, triturating with MeOH, and recrystg. from HOAc; faintly yellow plates, m.  $118-20^\circ$ ; a crystal is colored crimson by concd.  $\text{HNO}_3$  and gives a brown color in HOAc with  $\text{H}_2\text{SO}_4$ ; *semicarbasone*,  $\text{C}_{20}\text{H}_{20}\text{O}_4\text{N}_2$ , nodules from MeOH, m. and effervesces  $218-20^\circ$ . The  $\text{MnO}_2$  ppt. from the oxidation of (XXXV) was repeatedly extd. with small amts. of boiling  $\text{H}_2\text{O}$ , and the soln. concd. and acidified with HCl; the viscid ppt. (about 1 g.) was boiled with 200 cc.  $\text{H}_2\text{O}$ , filtered from tar, and the tar warmed with dil.  $\text{NH}_3$ , the soln. boiled with bone-black, and filtered. The acid was again pptd. and boiled with 100 cc.  $\text{H}_2\text{O}$  and the 2 aq. exts. were combined, neutralized with  $\text{Na}_2\text{CO}_3$ , mixed with bone-black, evapd. to about 20 cc., and filtered. On acidifying and recrystg. from HOAc 5,6-dimethoxy-*o*-toluic acid (39) (151) was obtained, the m. p. of this after repeated recrystn. from HOAc being  $184^\circ$  instead of  $177^\circ$ ; the mother-liquors from the purification of this were concd. *in vacuo* until nearly dry, mixed with sand, and extd. with  $\text{Et}_2\text{O}$  in a Soxhlet, the  $\text{Et}_2\text{O}$  yielding a small cryst. residue which was sepd. by crystn. from HCl into (39) and a more sol. acid sepg. from a little  $\text{H}_2\text{O}$  as hexagonal plates, m. about  $171-4^\circ$ , and yielding an anhydride m. about  $170-3^\circ$ , gave a negative Zeisel detn., and appears to be hydrastic acid,  $\text{CH}_2:\text{O}:\text{C}_6\text{H}_3(\text{CO}_2\text{H})_2(o)$ . (8) was reduced to (10) as follows: 10 g. (8), suspended in 260 cc. 97% alc., were gradually mixed with 130 cc. 97%  $\text{H}_2\text{SO}_4$ , the heat generated causing complete, permanent soln. of the (8). The electrolytic cell was a glass jar 20 cm. high, of 1 l. capacity; the cathode a sheet of Pb fitting around the inside and coated with electrolytic Pb; the anode, a strip of Pb, was placed in a porous cell 5 cm. in diameter, contg. 20%  $\text{H}_2\text{SO}_4$  which was replenished from time to time. The soln. was placed in the cathodic compartment and a current of 6 amps. passed for 48 hrs. After mixing with about 500 g. ice and  $\text{H}_2\text{O}$  and letting stand 24 hrs. a gray ppt. (5.3 g.) consisting partly of (8) was filtered off and an excess of  $\text{NH}_3$  added to the filtrate. The dark ppt. (4.6 g.) was dried, digested with a little MeOH to remove most of the color dissolved in boiling, very dil. HCl, bone-blackd, and the soln. concd., (10).HCl sepg. on keeping and becoming colorless on recrystn. from HOAc.

M. HEIDELBERGER.

**Morindone.** JOHN LIONEL SIMONSEN. *J. Chem. Soc.* 113, 766-74(1918).—Morindone (A) occurs in the root bark of *Morinda citrifolia* and *M. umbellata* chiefly as the glucoside morindin (B). *M. citrifolia* was used in the present work and the (B) extd. and purified essentially as given by Perkin and Hummel (*J. Chem. Soc.* 65, 851(1894)). After repeated crystn. from 75% alc. it seps. as voluminous, yellow needles, m.  $250-1^\circ$  when rapidly heated, sinters  $235^\circ$ , m.  $245^\circ$  when slowly heated. P. and H.'s formula,  $\text{C}_{20}\text{H}_{22}\text{O}_{14}$ , was confirmed, as against that of Oesterle and Tisza,  $\text{C}_{27}\text{H}_{30}\text{O}_{18}$  (*C. A.* 2, 830, 1997). Octaacetyl morindin (C), from (B) and  $\text{Ac}_2\text{O}$ , boiled with a trace of  $\text{C}_6\text{H}_5\text{N}$  for 2 hrs., m.  $239-40^\circ$  (P.,  $246-8^\circ$ ; O.,  $236^\circ$ ) and does not contain 9 Ac groups (O.). Since P. used *M. umbellata* and O. used *M. citrifolia* there appears to be no difference between the (B) isolated from the 2 sources in spite of the discrepancies in the work of these authors. Hydrolyzed with alc.  $\text{H}_2\text{SO}_4$  (B) yields (A), which is not attacked when heated at  $100^\circ$  with  $\text{AcOH-HBr}$  satd. at  $0^\circ$ , and remains unaltered when air is drawn through its alk. soln. for some days; heated 2 hrs. with  $\text{Ac}_2\text{O}$  and  $\text{NaOAc}$  it gives the triacetyl deriv. (D), pale yellow needles, sinters slightly above  $243^\circ$ , m.  $249^\circ$  (not  $222^\circ$  (P.)); it is not readily attacked by  $\text{CrO}_3$ , and attempts to oxidize the Me group with  $\text{CrO}_3$  failed, part of the (D) being completely destroyed and the rest unattacked; did not yield a Br deriv. at  $100^\circ$  with  $\text{AcOH-HBr}$  satd. at  $0^\circ$  as would have been the case if the group  $\text{CH}_3\text{OAc}$  had been present (cf. P., Thorp's "Dictionary of Applied Chem." III, 547). By the  $\text{C}_6\text{H}_5\text{N}$  method (A) yields the *tribenzoate* (E),  $\text{C}_{28}\text{H}_{28}\text{O}_8$ , yellow needles, m.  $218-9^\circ$ . The difficult complete methylation of (A) was

finally accomplished as follows: 3 g. (A) were mixed with a soln. of 12 g. KOH in 15 cc. H<sub>2</sub>O and 15 cc. Me<sub>2</sub>SO<sub>4</sub> added all at once. After vigorous stirring, the same amts. of KOH and Me<sub>2</sub>SO<sub>4</sub> were added and the deep red alk. soln. was boiled, acidified, and the crude product again methylated as before. The soln., containing in suspension a sparingly sol., red K salt (see below) and morindone trimethyl ether, C<sub>18</sub>H<sub>18</sub>O<sub>8</sub>, (F), was filtered, and the ppt. boiled 4 times with dil. alkali and then ground with a large vol. of CHCl<sub>3</sub>, which removed the (F), leaving the red salt. The CHCl<sub>3</sub> was evapd., the residue dissolved in hot C<sub>7</sub>H<sub>8</sub>, and the soln. washed with hot, dil. alkali to remove more of the partially methylated product. After filtering and blowing off the C<sub>7</sub>H<sub>8</sub> with



steam the (F) was obtained by recrystn. from HOAc; it had the properties given by O. and T. It dissolves in H<sub>2</sub>SO<sub>4</sub> with a blue color, behaves like (D) with CrO<sub>3</sub>, but is slowly oxidized when boiled in dil. Na<sub>2</sub>CO<sub>3</sub> suspension with KMnO<sub>4</sub>, only (CO<sub>2</sub>H)<sub>2</sub> being recovered, as was also the case when HNO<sub>3</sub> was used. The red K salt (see above) was suspended in hot H<sub>2</sub>O, decompd. with HCl, and the brown solid repeatedly recrystd. from HOAc; the *morindone monomethyl ether* (G), C<sub>14</sub>H<sub>14</sub>O<sub>6</sub>, forms brown, iridescent needles, m. 248°, gives a slightly redder color than (A) in H<sub>2</sub>SO<sub>4</sub>, changing to greenish red with a crystal of KNO<sub>3</sub>; dissolves in fuming HNO<sub>3</sub> with a transient red color, changing to red-brown; the solns. of the red K and Na salts are slightly fluorescent. (G) is readily attacked by alk. KMnO<sub>4</sub>, apparently undergoing complete disintegration, this indicating that the methylated OH is in the same ring as another OH group. 0.1 g. (G) was also obtained when 0.5 g. (A) were mixed with NaOMe (1.3 g. Na) and 0.8 g. MeI and heated at 100° for 8 hrs., poured into H<sub>2</sub>O, made alk. with KOH, and the mixt. boiled, filtered, and the residual K salt washed with hot, dil. alkali until the washings were only faintly colored. Heated 2 hrs. with Ac<sub>2</sub>O and NaOAc (G) gives *diacetylmorindone monomethyl ether*, C<sub>20</sub>H<sub>18</sub>O<sub>7</sub>, yellow prisms, m. 245–6°. The sugars from the hydrolysis of (B) were not characterized, only small amounts of 2 osazones being obtained, m. 207° and 195°, resp. The behavior of (A) on attempted oxidation indicates that the Me is *o*- to 1 of the OH groups, corroborative evidence being seen in the fact that *o*-MeC<sub>6</sub>H<sub>4</sub>OMe does not yield the CO<sub>2</sub>H compd. with CrO<sub>3</sub> in AcOH. Of the 4 possible trihydroxy-2-methylanthraquinones in which an OH is *o*- to the Me (I) and (II) are considered the most likely for (A), since S. believes that steric hindrance would prevent MeI from reacting with the others; the fact that only a mono-Me deriv. is obtained with MeI indicates that 2 of the OH groups are *o*- to the CO groups, and since (A) is a mordant dye resembling alizarin, it is possible that 2 OH groups are in the 1,2-positions. (A) cannot be a deriv. of anthragallol or purpurin, since it is not oxidized by air in alk. soln. (I) is considered more probable than (II), since in its color reactions (A) resembles hydroxyanthrarufin more closely than hydroxychrysazin.

M. HEIDELBERGER.

**Nitration of 2- and 6-methoxy-*m*-tolualdehydes and *m*-toluic acids.** JOHN LIONEL SIMONSEN. Madras. *J. Chem. Soc.* 113, 775–82(1918).—Expts. made in the course of an attempt to synthesize 3,4-MeO(Me)C<sub>6</sub>H<sub>3</sub>(CO<sub>2</sub>H)<sub>2</sub>(*o*-) with a view to prepg. anthraquinone derivs. 10 g. 2,3-HO(Me)C<sub>6</sub>H<sub>3</sub>CHO were dissolved in NaOMe (2 g. Na) and treated with 15 g. Me<sub>2</sub>SO<sub>4</sub>, the addition of NaOMe and Me<sub>2</sub>SO<sub>4</sub> being repeated 3 times, finally heating 15 min. on the H<sub>2</sub>O bath, adding H<sub>2</sub>O, extg. with Et<sub>2</sub>O, and drying and evapg. the ext.; the 2-methoxy-*m*-tolualdehyde (A) b<sub>4</sub> about 120°, viscid,

pleasant-smelling oil, giving a cherry-red color with  $\text{H}_2\text{SO}_4$ ; *oxime*, needles, m.  $118^\circ$ ; *semicarbazone*, needles, m.  $224^\circ$ . 2 g. (A) were added gradually to 10 g.  $\text{HNO}_3$  (d. 1.52), cooling with ice. After 15 min. the mixt. was poured on to ice, and the rapidly solidifying oil triturated with dil. aq.  $\text{Na}_2\text{CO}_3$  to remove a trace of 5-nitro-2-methoxy-m-toluic acid (B), dried on tile, and recrystd. from  $\text{Et}_2\text{O}$ -petr. ether; the 5-nitro-2-methoxy-m-tolualdehyde (C), 2,3,5-MeO(Me)( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{CHO}$ , forms needles, m.  $61-2^\circ$ ; *semicarbazone*, needles, m.  $233^\circ$ . 0.5 g. (C) in 5 cc. warm MeOH, mixed with 0.5 g. acetone, and heated to boiling for a few min. after adding 2 drops 50% KOH, gave 5,5'-dinitro-2,2'-dimethoxy-di-3-m-methylstyryl ketone, yellow needles, decomp.  $252^\circ$ . (B) is more easily obtained by dissolving 1.2 g. (C) in 30 cc. acetone and gradually adding 0.65 g. powdered  $\text{KMnO}_4$ , then adding  $\text{H}_2\text{O}$ , boiling, filtering off the  $\text{MnO}_2$ , concg. until free from acetone, removing a trace of unchanged (C), and acidifying; it forms needles, m.  $154^\circ$ ; *silver salt*, pale yellow needles. (B) was also prepd. by methylation of the corresponding OH acid (Einhorn and Pfyl, *Ann.* 311, 47(1900)). Oxidation of (A) in acetone by  $\text{KMnO}_4$  gave 2-methoxy-m-toluic acid,  $\text{C}_8\text{H}_9\text{O}_3$ , needles, m.  $83^\circ$ ; *silver salt*, caseous ppt.; nitrated at  $30^\circ$  with 3 parts  $\text{HNO}_3$  (d. 1.52) it gives (B). 3 g. 3,6-(CHO)(MeO) $\text{C}_6\text{H}_3\text{Me}$  were slowly added to 9 g.  $\text{HNO}_3$  (d. 1.52), cooling with ice-salt, pouring on to ice after 10 min.; the resulting 5-nitro-6-methoxy-m-tolualdehyde (D), 3,5,6-(CHO)( $\text{O}_2\text{N}$ )(MeO) $\text{C}_6\text{H}_3\text{Me}$ , forms needles, m.  $77^\circ$ ; *semicarbazone*, needles, decomp.  $235^\circ$ ; 5,5'-dinitro-4,4'-dimethoxydi-3-methylstyryl ketone, yellow needles, m.  $214^\circ$ . 5-Nitro-6-methoxy-m-toluic acid (E), softens  $175^\circ$ , m.  $180-1^\circ$ ; *calcium* and *barium* salts, needles; *methyl ester*, needles, m.  $47^\circ$ . When gradually added to 3.5 parts  $\text{HNO}_3$  (d. 1.52) at  $30-5^\circ$  3,6-( $\text{HO}_2\text{C}$ )(MeO) $\text{C}_6\text{H}_3\text{Me}$  gives (E), extd. from the crude product by dil. aq.  $\text{Na}_2\text{CO}_3$ , and a neutral substance, apparently 6-nitro-o-tolyl methyl ether, 2,6-MeO( $\text{O}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{Me}$ , needles, m.  $69^\circ$ , only slightly attacked by hot, alk.  $\text{KMnO}_4$ , but when 0.25 g. was dissolved in 1 cc.  $\text{H}_2\text{SO}_4$  and gradually treated with a soln. of 0.3 g.  $\text{CrO}_3$  in 2 cc.  $\text{H}_2\text{SO}_4$ , followed by the addition of  $\text{H}_2\text{O}$ , what appeared to be 6-nitro-2-methoxybenzoic acid pptd., needles, m.  $161^\circ$ , purified by dissolving in dil. aq.  $\text{Na}_2\text{CO}_3$ , filtering from unattacked material, and pptg. with acid. While S. and Rau's suggestion (C. A. 11, 1950) as to the orientating effect of negative groups o- to positive groups appears to hold in the case of the nitration of  $\text{AcNH-MeO}$  derivs. it does not seem to be of general application, as 6- $\text{NO}_2$  derivs. were to be expected in this case.

M. HEIDELBERGER.

**N-Acyl derivatives of carbazole.** MAURICE COPISAROW. Univ. Manchester. *J. Chem. Soc.* 113, 816-20(1918).—It has been possible to extend the list of the few substances of this class known by improving upon the unsatisfactory methods at present available (references given). The present method depends upon the trituration of K carbazole (A) with gradual additions of the acid chloride, added in slight excess. After 2 hrs. the mixt. is extd. with  $\text{H}_2\text{O}$ , dil.  $\text{Na}_2\text{CO}_3$ , and  $\text{H}_2\text{O}$ , and finally dried. *N*-Acetylcarbazole (Böeseken, C. A. 7, 1179); *N*-benzoylcarbazole. *N*-Phenoxyacetylcarbazole, needles from alc., decomp.  $121-2^\circ$  with regeneration of carbazole (B); *N*-nonoylcarbazole, needles from alc., m.  $72-3^\circ$ , gives (B) on heating above its m. p.; *N*-palmitylcarbazole, keeping the reaction mixt. at  $75^\circ$  for 2 hrs., with occasional trituration, needles from alc., m.  $90-1^\circ$ , rhombs from PhH. When dry  $\text{COCl}_2$  was passed over finely powdered (A), regulating the current of gas so as to keep the temp. of the energetic reaction at  $150-60^\circ$ , *N*-carbonylcarbazole was obtained,  $(\text{C}_{12}\text{H}_8\text{N})_2\text{CO}$ , purified by fractional crystn. from alc., the 1st crop being mainly (B); after 3 crystns. from alc. it forms needles, m.  $181-3^\circ$ ; condensation between (A) and  $\text{COCl}_2$  fails to take place even in boiling  $\text{C}_6\text{H}_{10}$  (cf. also Paschkowetzky, *Ber.* 24, 2905(1891) who used PhH). *N*-Oxalylcarbazole (C),  $(\text{C}_{12}\text{H}_8\text{N.CO})_2$ , prepd. as in the case of the monobasic derivs., rhombs from  $\text{PhNO}_2$  or  $\text{CS}_2$ , m.  $265-6^\circ$ , is the only one of the acyl deriva.



which does not give in  $\text{H}_2\text{SO}_4$  soln. the green color with concd.  $\text{HNO}_3$  characteristic of (B) and many of its derivs.; heated above  $200^\circ$  or fused above  $200^\circ$  with a large excess of  $(\text{CO}_2\text{H})_2$ , no "carbazole blue" is formed, nor is the dye formed when the product of the reaction between  $(\text{COCl})_2$  and (B) is heated above  $200^\circ$ , this showing that (C) cannot be regarded as an intermediate step in the formation of the dye, which is prepd. by the fusion of (B) with  $(\text{CO}_2\text{H})_2$  (Suida, *Ber.* 13, 1403(1879); Bamberger and Müller, *Ber.* 20, 1903(1887)).

M. HEIDELBERGER.

**The boiling points of the paraffins.** GERVAISE LE BAS. *Chem. News* 117, 241-2 (1918).—According to Hinrichs and Naumann, the more considerable the branching of the chain of a compd. or, on the other hand, the more compact the mol., the lower is the b. p. The author shows, however, that for paraffins, diminution of the b. p. depends on the substitution of the  $\beta$ ,  $\gamma$ , and  $\delta$  C atoms by Me groups. The assumption of two similar Me groups, attached to one C atom in the formula of iso compds. of the type  $\text{Me}_2\text{CR}$  is not true from the point of view of b. ps. which involves the substitution of the H of  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$  C atoms of the hydrocarbon chain by a single Me group. The difference in b. p. due to this structure is  $6-7^\circ$  when substitution of the  $\beta$ -methylene group has been effected and  $9^\circ$  when the  $\gamma$ -methylene group has been substituted. A table is given showing the effect of substitution of the Me group in paraffins on the b. p. Thus, *n*-hexane b.  $69^\circ$ ; the b. p. of  $\text{Me}_2\text{CHPr}$  ( $\beta$ -substitution) is  $62^\circ$ , a difference of  $-7^\circ$ , while the b. p. of  $\text{EtCHMeEt}$  ( $\gamma$ -substitution) is  $60^\circ$ , a difference of  $-9^\circ$ . Where two or three substitutions occur, the diminution of the b. p. is proportionately great. Evidence in favor of the view that the diminutions are connected with substitution of hydrocarbon chains by Me groups is that the diminution almost disappears when the Me group is replaced by one of greater complexity. When the  $\beta$ -methylene group is substituted by two Me groups, the number to be counted is three or four as the case may be, never two. The causes of the above changes may be that the presence of Me groups diminishes the residual affinity, or the intermol. cohesion. Two contiguous Me groups cause a rise in b. p. owing to their mutual action in increasing the residual affinity or intermol. cohesion.

C. H. KIDWELL.

**The mechanism of the electrochemical synthesis of carbamide.** FR. FICHTER. *Basel. Z. Elektrochem.* 24, 41-5(1918); *J. Chem. Soc.* 114, I, 215-6.—By a series of expts. F. shows that the electrochem. synthesis of carbamide from a soln. of  $(\text{NH}_4)_2\text{CO}_3$  (Drechsel, *J. prakt. chem.* 22, 476) is due to an oxidizing anodic reaction and is not a specific a. c. reaction. Former hypotheses are inadequate since the synthesis may be also carried out by adding to an ice-cooled, concd.  $\text{NH}_3$  soln. of a mixt. of  $(\text{NH}_4)_2\text{CO}_3$  and  $\text{NH}_2\text{CO}_2\text{NH}_4$  such oxidizing agents as  $\text{Ca}(\text{MnO}_4)_2$ ,  $\text{H}_2\text{O}_2$ , and ozonized  $\text{O}_2$ . The chief reaction is the oxidation of  $\text{NH}_3$  to  $\text{NH}_4\text{NO}_2$  or  $\text{N}_2$  and to  $\text{NH}_4\text{NO}_3$ . Heat set free at the anode or at the surface of contact with the oxidizing reagent, during the oxidation, is removed by external cooling to prevent loss of  $\text{NH}_3$ . By this local heating of the soln. some  $(\text{NH}_4)_2\text{CO}_3$  is converted into  $\text{CO}(\text{NH}_2)_2$ . The formation of carbamide by this anodic and oxidizing process is similar to that occurring in the living organism. The following equations express the formation of carbamide from  $(\text{NH}_4)_2\text{CO}_3$  or  $\text{NH}_2\text{CO}_2\text{NH}_4$ :



Since  $(\text{NH}_4)_2\text{CO}_3$  cannot exist in the presence of  $\text{H}_2\text{O}$  at and above  $135^\circ$ , only the right half of the equation is operative at and above that temp.; equil. shifts to the right as the temp. falls. Below  $135^\circ$  an increasing proportion of the  $(\text{NH}_4)_2\text{CO}_3$  is converted into the more stable carbamate. Addition of  $\text{H}_2\text{O}$  is necessary to prevent the withdrawal of  $(\text{NH}_4)_2\text{CO}_3$  from the reaction. The lower the temp., the greater the amt. of  $\text{H}_2\text{O}$  necessary to make the formation of carbamide possible. Solns. containing 1 mole of  $(\text{NH}_4)_2\text{CO}_3$  and 9 moles of  $\text{H}_2\text{O}$  serve best for carbamide production. If the

local temp. elevation does not exceed  $100^{\circ}$ , calcns. of the yield of carbamide do not contradict the hypothesis, inasmuch as the actual yields are much below the calcd. values. The above results show that from  $(\text{NH}_4)_2\text{CO}_3$  only, is the direct formation of carbamide possible.

C. H. KIDWELL.

**The transformation of methyl  $\alpha$ -eleostearate into methyl  $\beta$ -eleostearate.** R. S. MORRELL. *J. Soc. Chem. Ind.* 37, 181-2T(1918).—Chinese wood oil, d. 0.944,  $n_D^{15}$  1.5171 ( $12.5^{\circ}$ ), was thickened at  $240^{\circ}$  for 20 min., cooled rapidly, and treated with acetone. The thickened oil had d. 0.9638 ( $15^{\circ}$ ) and a mol. wt. of 1431 (in  $\text{C}_6\text{H}_6$ ). Both the sol. (polymerized) part "A" and the insol. part "B" were transformed into Me esters by NaOMe (Bull's method). The Me ester from "A" had  $d_{10}^{20}$  0.9159,  $n_D^{10}$  1.4958, mol. wt. (in  $\text{C}_6\text{H}_6$ ) 300; I value 151.8 (1.5 hrs.), 178 (6 days). The Me ester from "B" had  $d_{10}^{20}$  0.936;  $n_D^{10}$  1.49850; I value 138 (1.5 hrs.), 168 (6 days); mol. wt. ( $\text{C}_6\text{H}_6$ ) 393. The Me esters were fractionated under 10 mm. The Me ester from "A," redistd. between  $209^{\circ}$  and  $224^{\circ}$  and sapon. in the cold, gave an acid, m.  $66-9^{\circ}$ , which on thrice recrystg. from 60% alc. gave  $\beta$ -eleostearic acid,  $\text{C}_{18}\text{H}_{32}\text{O}_2$ , m.  $71-2^{\circ}$ , I value 172. The Me ester from "B" treated the same way gave an acid of practically the same properties. Examn. of the Ce salt from the undistd. Me ester obtained from "A" showed that  $\alpha$ -acid was present almost entirely and no  $\beta$ -acid. The conclusion is drawn that stereoisomeric change has occurred during distn. of the ester although NaOMe or polymerization may be factors in the transformation of Me  $\alpha$ -eleostearate into the  $\beta$ -ester.

C. H. KIDWELL.

**Constitution of the true nucleic acids.** R. FEULGEN. *Z. physiol. Chem.* 101, 288-95(1918); *J. Chem. Soc.* 114, I, 413.—A theoretical paper in which the general arrangement of the nucleotides in nucleic acid suggested by Levene is accepted, though the precise method of linking together of the nucleotides is regarded as unsettled.

C. J. WEST.

**Preparation and properties of thymic acid.** R. FEULGEN. *Z. physiol. Chem.* 101, 296-309(1918); *J. Chem. Soc.* 114, I, 413.—Thymic acid is prepd. by treating Na nucleinate with a slight excess of  $\text{H}_2\text{SO}_4$  and keeping the mixt. for 40 minutes at  $80^{\circ}$ . The acid is sepd. in the form of its Ba salt, and on hydrolysis yields cytosine and thymine.

C. J. WEST.

**Sitosterol.** A. WINDAUS AND ERIK RAHLEN. *Z. physiol. Chem.* 101, 223-35; *J. Chem. Soc.* 114, I, 388-9.—In the presence of Pd, sitosterol in AcOH soln. is reduced by H at  $100^{\circ}$ , forming *sitostanol*,  $\text{C}_{27}\text{H}_{48}\text{O}$ , flat 4- or 6-sided plates from alc., m.  $137^{\circ}$ ,  $[\alpha]_D^{20}$   $27.9^{\circ}$ ; acetate, m.  $132^{\circ}$ . The new compd. closely resembles cholestanol and on oxidation with  $\text{CrO}_3$  yields *sitostanone*,  $\text{C}_{27}\text{H}_{46}\text{O}$ , plates from alc., m.  $157^{\circ}$ ,  $[\alpha]_D^{20}$   $45.7^{\circ}$ , and with excess of  $\text{CrO}_3$ , *sitostandicarboxylic acid*,  $\text{C}_{27}\text{H}_{44}\text{O}_4$ , plates from AcOH, m.  $225-7^{\circ}$ . Both the latter compds. are analogous to, but not identical with, the corresponding derivs. cholestanol, and cholestandicarboxylic acid. On distn. of a mixt. of sitostandicarboxylic acid and  $\text{Ac}_2\text{O}$  at  $280^{\circ}$  in a vacuum,  $\text{CO}_2$  and  $\text{H}_2\text{O}$  are evolved and a *cyclic ketone* is produced,  $\text{C}_{26}\text{H}_{44}\text{O}$ , well-formed hexagonal crystals from MeOH, m.  $112^{\circ}$ . Reduction of sitostanone with Zn-Hg in boiling AcOH soln. yields the hydrocarbon, *sitostan*,  $\text{C}_{27}\text{H}_{48}$ , m.  $85-5.5^{\circ}$ , which resembles cholestan (m.  $80-1^{\circ}$ ), but is certainly not identical with it. The observed difference between these derivs. of sitosterol and the corresponding ones derived from cholesterol indicate that the general resemblance of the parent substances cannot be ascribed to the possession of a common structure with a difference in the position of the HO radical, the double linking or both. The difference between sitosterol and cholesterol must therefore be structural or steric.

C. J. WEST.

**Dissociation as a general phenomenon with hydrocarbons.** HANS MEYER AND ALICE HOFMANN. *Monatsh.* 39, 107-28(1918); *J. Chem. Soc.* 114, I, 383.—The ob-

served action of heat on org. substances, particularly hydrocarbons, indicates the occurrence of dissociation of H from C at a C-H linking; the effect is not appreciable at the ordinary temp., but becomes so when the dissociation pressure is favored by rise of temp., the influence of light and of electrical or radioactive radiation. Substances which will remove one or other of the products of the dissociation should also extend its effect, and examples are quoted in which oxidation is already known to cause a condensation of 2 aromatic nuclei. The general evidence supplied by the nature of the constituents of coal tar supports the further view that in pyrogenic reactions long side chains tend to become shortened, and this accords well with the fact that longer chains are more easily attacked, for example, by oxidizing agents. An examn. of anthracene revealed the presence of diphenyl, together with a mixture of the ditolyls, but dibenzyl could not be detected. Isopropylbenzene when heated strongly decomps. mainly into  $C_7H_8$  and  $(HCHO)_2$ , the latter arising from the severed methylene groups. Me phthalate gives  $PhCO_2Me$ ,  $HCHO$  and Me diphenyltricarboxylate.  $AcOMe$  gives  $\alpha$ -trioxymethylene as the main product and no Et succinate. The action of sunlight on a suspension of Et dihydrolutidinedicarboxylate in  $C_6H_6$  gives Et lutidinedicarboxylate.

C. J. WEST.

**Lignin.** I. Lignosulfonic acid. M. HÖNIG AND JACQUES SPITZER. *Monatsh.* 39, 1-14 (1918); *J. Chem. Soc.* 114, I, 375.—The lignosulfonic acid obtained from different sulfite liquors varies considerably in compn. and consists of a mixt. of substances. By fractional pptn. of the Ca salt or Ba salt from aqueous soln. by alc., it is possible to obtain fractions of distinct compn. approximating, for the Ba salt, to the formulas  $C_{20}H_{20}O_{11}S_2Ba$ ,  $C_{28}H_{24}O_{12}S_2Ba$ , and  $C_{74}H_{114}O_{48}S_2Ba$ .

C. J. WEST.

The configuration of organic compounds and their relation to chemical and physical properties. II. ARTHUR MICHAEL. *J. Am. Chem. Soc.* 40, 1674-707 (1918); cf. *C. A.* 12, 908.—In the present paper the physical and chem. properties of the stereomeric unsatd. acids are coordinated with the configurations given in the first paper, as far as exptl. evidence permits, and previous views in this field are critically revised. Of the physical properties, density, soly., m. p., b. p., viscosity, optical activity, magnetic rotation and heat of combustion are discussed; of the chem. properties, addition, elimination, substitution, anhydride formation, stereomutation, catalysis and esterification are taken up. No new exptl. data are given.

C. A. R.

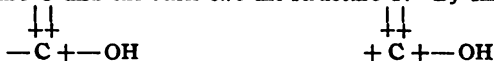
**Effect of sodium on mixtures of malonic and succinic esters.** GERALD E. K. BRANCH AND H. E. HUDSON BRANCH. *J. Am. Chem. Soc.* 40, 1708-13 (1918).—Equimol. mixts. of malonic and succinic esters heated with Na gave chiefly succinosuccinic ester; when a large excess of malonic ester was used phloroglucinoltricarboxylic ester was found; by using succinosuccinic and malonic esters malonylsuccinic ester was obtained. The results are explained by Dieckmann's theory that the acetoacetic ester condensation is reversible.

CHAS. A. ROUVILLER.

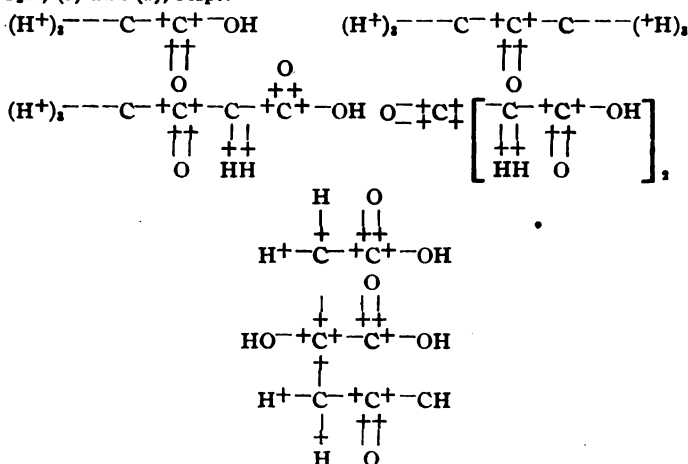
**Proteinogenous amines.** I. Synthesis of  $\beta$ -imidazolyethylamine (histamine). KARL K. KOESSLER AND MILTON TH. HANKE. *J. Am. Chem. Soc.* 40, 1716-26 (1918).—In the main Pyman's method (*C. A.* 5, 3047) was followed but several additions and improvements have been made and a detailed account of the steps involved is given. Starting with 4530 g. citric acid, the following approximate average amts. of the various products involved in the synthesis can be obtained. Acetonedicarboxylic acid, 3300; diisonitrosoacetone, 1089; diaminoacetone chlorostannite, 2640; diaminoacetone hydrochloride, 1200; 2-thiol-4-aminomethylglyoxaline hydrochloride, 950; 4-hydromethylglyoxaline picrate, 1670; hydrochloride, 740; 4-chloromethylglyoxaline hydrochloride, 700; 4-cyanomethylglyoxaline, 200; imidazolyethylamine dihydrochloride, 165 g.

CHAS. A. ROUVILLER.

**Electronic constitutions of acetoacetic and citric acids and some of their derivatives.** MILTON T. HANKE AND KARL K. KOESSLER. *J. Am. Chem. Soc.* 40, 1726-32 (1918).—When citric acid (a) is treated with fuming  $\text{H}_2\text{SO}_4$ , the central  $\text{CO}_2\text{H}$  group is removed as  $\text{CO}$ , with formation of  $\text{CO}(\text{CH}_2\text{CO}_2\text{H})_2$  (b); the reason for this selection of the central  $\text{CO}_2\text{H}$  group must be due to a difference in the direction of the valence force holding this group from that holding the 2 end  $\text{CO}_2\text{H}$  groups. The addition reactions of  $\text{CO}$  show that its electrical structure is  $\text{C}^+\text{C}^+\text{O}$ , whence the central  $\text{CO}_2\text{H}$  in (a) must have the structure  $\text{O}$  and the other two the structure  $\text{O}$ . By similar reasoning



based on the behavior of  $\text{AcCH}_2\text{CO}_2\text{H}$  on hydrolysis and on the addition reactions of  $\text{CH}_2:\text{C}:\text{O}$ , H. and K. arrive at the following electronic formulas for  $\text{AcOH}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{AcCH}_2\text{CO}_2\text{H}$ , (b) and (a), resp.:



CHAS. A. ROULLIER.

**The reaction between acid halides and aldehydes. I.** ROGER ADAMS AND E. H. VOLLWEILER. *J. Am. Chem. Soc.* 40, 1732-46 (1918).—To prep. the following addition compds. equimol. amts. of the aldehyde and acid halide (in the case of  $(\text{COBr})_2$ , 2 mols. aldehyde to 1 of bromide) were allowed to stand in well stoppered flasks until solidification took place; with aliphatic compds. the mixts. must be heated, often under pressure. The ease of formation varies greatly for different compds. and no general conclusions can be drawn as to effect of various groups on the speed of formation; the indications are, however, that negatively substituted compds. react less readily than the unsubstituted ones. The products have the general structure  $\text{RCO}_2\text{CHXR}'$  or  $(\text{CO}_2\text{CHXR})_2$ . Ag salts of org. acids,  $\text{R}'\text{CO}_2\text{Ag}$ , give  $\text{AgX}$  and  $\text{RCO}_2\text{CHR}'\text{O}_2\text{CR}'$ .  $\text{H}_2\text{O}$  gives the aldehyde, org. acid and halogen acid, the difference in the rate of decompn. of different compds. being very marked. Alc. gives the aldehyde, organic acid ester and halogen acid. Dry  $\text{NH}_3$  in  $\text{Et}_2\text{O}$  yields the aldehyde, org. acid amide and  $\text{NH}_4$  halide, while  $\text{PhNH}_2$  in dry  $\text{Et}_2\text{O}$  reacts quant. according to the equation  $\text{RCO}_2\text{CHXR}' + \text{PhNH}_2 = \text{RCO}_2\text{H} + \text{PhNHCHXR}'$ . The following *benzoyl bromide addition products* are described: *o*-bromobenzaldehyde (yield, quant. in 7 hrs.), crystals from ligroin, m.  $106-7^\circ$ ; *p*-bromobenzaldehyde (quant. yield in 3 hrs.), m.  $110^\circ$ ; nitroanisaldehyde (yield, quant. in 3 hrs.), m.  $101-2^\circ$ ; acetovanillin (yield, 75% in a few hrs.), m.  $102-3^\circ$ ; *p*-nitrobenzaldehyde (small yield in 1 day), m.  $89-90^\circ$ ; bromopiperonal, m.  $108-13^\circ$ ; terephthalaldehyde,  $\text{C}_{10}\text{H}_8\text{O}_4\text{Br}_2$ , crystals from  $(\text{CH}_2\text{Cl})_2$ , m.  $153-62^\circ$ ; piperonal (small

yield after several days), m.  $105-10^{\circ}$ , at once decomps. in air; *methyl salicylaldehyde*, m. about  $50^{\circ}$  but decomps. in the air in 10 sec.; *methylvanillin*, m.  $100^{\circ}$ , decomps. in a few sec. *Benzoyl chloride addition compounds*: *bromomethylvanillin* (after 1 week), m.  $158-60^{\circ}$ ; *bromopiperonal* (after 1 week), m.  $97-102^{\circ}$ . *o-Nitrobenzoyl chloride-benzaldehyde*, in 80% yield after 1 week, m.  $81-2^{\circ}$ ; *m-isomer* (quant. yield after 3 months or, when seeded, after 5-6 days), yellow crystals from ligroin, m.  $87-8^{\circ}$ ; *p-isomer* (quant. yield in 5 days), yellow crystals, m.  $118-8.5^{\circ}$ , stable in air and  $H_2O$  and even for a short time in cold  $Na_2CO_3$ . *Oxalyl bromide addition compounds*: *BzH*, m.  $130-1^{\circ}$ ; *o-bromobenzaldehyde* (quant. yield in 10 hrs.), m.  $140^{\circ}$ ; *cinnamic aldehyde*, m.  $85-6^{\circ}$ ; *anisaldehyde*, m. about  $66^{\circ}$  (decompn.); *nitroanisaldehyde*, m.  $116-8^{\circ}$ ; *m-nitrobenzaldehyde* yellow crystals, m.  $128-9^{\circ}$ ; *piperonal*, m.  $81-3^{\circ}$ ; *vanillin* (yield, 90% after 10 min. in  $Et_2O$ ), m.  $93-5^{\circ}$ ; *acetovanillin*, m.  $142-3^{\circ}$  (decompn.); *furfural*, m.  $76-7^{\circ}$ . *Benzalidene acetate benzoate*,  $PhCH(OAc)OBz$ , from the  $BzBr-BzH$  addition compd. and  $AgOAc$  in  $Et_2O$ , m.  $71-2^{\circ}$ . *Benzalidene benzoate p-nitrobenzoate*, from the  $BzH-O_2NC_6H_4COCl$  compd. and  $BzOAg$ , yellow crystals from  $Et_2O$ -petr. ether, m.  $65-7^{\circ}$ . *Benzylidene-o-toluidine*, from the  $BzBr-BzH$  compd. and  $o-MeC_6H_4NH_2$ , m.  $210-2^{\circ}$ . C. A. R.

The industrial preparation of lactic acid from sugar beets. A. BONELLI AND G. GULINELLI. *Ind. chim. min. met.* 5, 121-4 (1918).—Raw beet juice has proved to be a very satisfactory material from which to prep. lactic acid in Italy. The juice is fermented in acid-proof vats, air being blown in and powdered lime added from time to time in such quantity as to maintain an acidity equiv. to 5-7 g.  $H_2SO_4$ . The fermented juice is pumped through heating coils into a "defecator," where it is treated with 1.5-2.5%  $CaO$ . Excess lime is pptd. by  $CO_2$ . After filterpressing the soln. is concd. in multiple-effect evaporators to  $32-4^{\circ}$  B $\acute{e}$ . The hot liquor is acidified with  $50-3^{\circ}$  B $\acute{e}$ .  $H_2SO_4$  in water a cooled tank, cooled and centrifuged. The liquor is then treated with  $Ca_2Fe(CN)_6$  to remove iron, neutralized with lime, and filter-pressed, giving a product containing 40-5% lactic acid. J. S. LAIRD.

Arsenotungstic and arsenotungstomolybdic complexes as reagents of phenolic amines (GUGLIAMELLI) 7. Crystallography and optical properties of three aldopentoses (WHERRY) 2. Artificial coloration of spherulites with helicoidal development (GAUBERT) 2. Nitrating organic compounds (U. S. pat. 1,283,617) 24. Mixed ketones for use as solvents (U. S. pat. 1,283,183) 23. Diolefins (U. S. pat. 1,282,906) 22.

HENRICH, FERDINAND: *Theorien der organischen Chemie*. Braunschweig: Friedr. Vieweg & Sohn. 500 pp. M. 22.

HOLLEMAN, A. F.: *Praktische oefeningen in de organische chemie*. Groningen. The Hague: J. B. Wolters. 76 pp. f. 1.90.

STODDARD, J. T.: *Introduction to Organic Chemistry*. 2nd Ed. revized. Philadelphia: P. Blakiston's Son & Co. 423 pp. \$1.50.

Acetic anhydride. H. DREYFUS. U. S. 1,283,115, Oct. 29.  $Ac_2O$  is made by reaction of a mixt. of  $H_2SO_4$  with 50-70% free  $SO_3$  upon  $NaOAc$  or other acetate in dry form, at a temp. maintained below  $-5^{\circ}$ , in the presence of liquid  $Ac_2O$ .

Oxidizing side chains of aromatic hydrocarbons. H. D. GIBBS. U. S. 1,284,887, Nov. 12. In oxidizing the side chain of an aromatic hydrocarbon, e. g., in making *benzaldehyde* and *benzoic acid*, from toluene, a mixt. of the vaporized hydrocarbon with air passed over a catalyst consisting of oxides of V at a temp. of  $200-400^{\circ}$ . Oxides of Al, Sb, Bi, Ce, Cr, Ag, Co, Mg, Mo, Sn, Ti, W, V and Zn also may be used.

Phthalic anhydride, phthalic acid, benzoic acid and naphthoquinones by the oxidation of naphthalene. H. D. GIBBS and C. CONOVER. U. S. 1,284,888, Nov. 12. Oxidation of  $C_{10}H_8$  is effected by passing a mixt. of  $C_{10}H_8$  vapor and air over Mo, oxides heated to 350–550° (preferably 500°).

Alcohols, esters. DU PONT DE NEMOURS & Co. Brit., 119,249, June 9, 1917. Alcs. are prepd. by reacting with a halogen hydrocarbon on a salt of a higher fatty acid, e. g., Na stearate, and saponifying the resulting ester. A suitable app. is specified. The reaction vessel, e. g., is half filled with stearic acid, the equiv. of solid NaOH is added, the mixt. is heated by an oil jacket to 200–40°, and a mixt. of pentyl and hexyl chlorides is run in from a suitable vessel. Unchanged chlorides, and olefins produced as by-products, distil over to condenser and receptacle. The reaction vessel is then cooled to 150°, NaOH is added, and the vessel again heated to saponify the esters. The resulting alcs. are distd. off in steam, and the process is repeated until the stearate in the reaction vessel has become highly charged with salt. Then the mixt. is removed, acidified, warmed, and the stearic acid decanted off, and washed for re-use. In a modified construction of app., a reflux condenser is provided to return unchanged chlorides to the reaction vessel, while only the olefins pass off to the condenser.

Ethyl alcohol from acetaldehyde. T. LICHTENHAHN. Can. 187,609, Nov. 26, 1918. EtOH is prepd. from AcH by reduction with H in the presence of a catalyst, the H used being in such large excess that the heat of reaction of nearly 300 calories per kg. of EtOH produced is carried away by the H, so as to maintain a const. temp. favorable for smooth reaction without decomposing the AcH.

Salicylic acid from *o*-cresol. H. TERRISSE. Swiss 78,105, June 17, 1918. *o*-Cresol is fused with a caustic alkali in the presence of an alkali metal and an oxidizing agent.

Benzoylating amino organic compounds. F. REVERDIN. Swiss 76,558, June 17, 1918. In the benzoylation of amino derivs. of organic substances by acting thereupon with BzCl, a small amt. of concd.  $H_2SO_4$  is added to the amino deriv. and the BzCl, and the reaction is effected at a moderate temp. and without employing a solvent.

Alkylating agents. E. J. BOAKE and T. H. DURRANS. Brit. 119,250, June 20, 1917.  $Me_2SO_4$ ,  $MeHSO_4$ , and MeCl are prepd. by treating MeOH (2 mols.) with  $SO_2$  (1 mol.) and Cl (1 mol.). The two gases are passed, simultaneously or successively, into the alc.; MeCl is evolved; the reaction product is heated to drive off dissolved MeCl, and is then distd. under reduced pressure; the  $MeHSO_4$  is thus converted into  $Me_2SO_4$ , which distils off with that formed in the primary reaction. The MeCl may be freed from HCl and excess of  $SO_2$  by NaOH soln. or slaked lime, and may be liquefied by cold or pressure.

Apparatus for making sodium salicylate by the "Bayer" process. J. D. SARTAKOFF. U. S. 1,284,468, Nov. 12. Drums are provided in which  $PhONa$  soln. is evapd. and treated with  $CO_2$  and the increase in temp. within the drums is regulated automatically.

## II. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT, WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

Retardation by sugars of diffusion of acids in gels. EVARTS A. GRAHAM AND HELEN TREDWAY GRAHAM. *J. Am. Chem. Soc.* 40, 1900–17(1918).—This work was undertaken to find out, if possible, whether the protective action of carbohydrates

against certain toxic agents in the body can be paralleled outside of the body, and the data obtained on the diffusion of electrolytes in gels are discussed in the present paper from the chem. point of view. Into 14-5 mm. tubes at 26° containing 20 cc. of 10% gelatin gels plus a few drops of lysol, enough litmus to give a decided color (and neutralized with 0.2 N NaOH) and the different sugars (glucose, saccharose, lactose) in 0.025 to 0.5 M concn., were carefully introduced 15 cc. of 0.2 N solns. of the acids (HCl, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, lactic, HCO<sub>2</sub>H, AcOH, PrCO<sub>2</sub>H), and the velocity of the downward diffusion of the H ion was detd. at definite intervals during 144 hrs. by measuring the position of the line of division between the acid and neutral shades of the litmus. The results are reproduced in tables and curves. It was found that the diffusion of the H ion is markedly retarded by the presence of sugars. In agreement with the diffusion law the ratio of the distance of diffusion to the square root of the time was in general found to be constant in the gelatin with or without sugar. The decrease in this ratio with increasing sugar concns. is not proportional to the concn. of the sugar but is relatively greater for the smaller concns.; the exptl. ratio can be approximately represented by the equation  $(\Delta/K_0)^* = ac$ , where  $\Delta/K_0$  is the relative retardation,  $a$  and  $n$  are constants and  $c$  is the concn. of the sugar. NaCl in the gelatin also retards the diffusion of acids but to a less extent than sugar in equal concn. The mechanism of the retardation is briefly discussed.

C. A. R.

#### Salivary amylase. I. A preliminary experimental study of its stability in saliva.

ROLLIN C. MYERS AND LEONARD C. SCOTT. *J. Am. Chem. Soc.* 40, 1713-6(1918).—Salivary amylase in sterilized saliva without preservative is relatively stable for 1 year, this relative stability varying from practically no change to a decrease of over 50% in amylolytic activity, the variation depending probably on slight differences in compn. of the saliva. The causes which lower the stability of salivary amylase in saliva are not solely the degrading action of bacteria, mold spores, yeast plants and special preservatives; the inherent chem. weakness of the enzyme mol., rather, must be taken into account; this weakness may be increased by temps. of 18° to 30°, diffused light and compds. in saliva. Salivary amylase in saliva is relatively stable for a year in the presence of toluene, CHCl<sub>3</sub>, or thymol; toluene has the least destructive action and thymol and CHCl<sub>3</sub> follow in the order given. Saliva may be kept for 2.5 years under ordinary laboratory conditions without preservative and still show a form of amylolytic activity.

C. A. ROULLER.

The chemotaxis of bacteria against optically active amino acids. H. PRINGSHEIM AND G. ERNST. *Z. physiol. Chem.* 97, 176-90; *Physiol. Abstracts* 3, 298-9.—Amino acids, extd. from org. tissues, and those obtained synthetically were compared in regard to their chemotactic effect on bacteria. The threshold of excitation in the case of synthetically obtained amino acids was found to be 100-1000 times higher than for natural amino acids even when the substances in the 2 cases were optically isomeric.

C. J. WEST.

Compounds derived from proteins by energetic treatment with nitric acid. F. KNOPP. *Z. physiol. Chem.* 101, 210-1(1918); *J. Chem. Soc.* 114, I, 412.—The unidentified acid substances discovered by Mörner among the oxidation products of proteins are probably 5-nitroglyoxaline-4-carboxylic acid, C<sub>8</sub>H<sub>5</sub>O<sub>4</sub>N<sub>3</sub>, and glyoxaline-4-glyoxylic acid, C<sub>8</sub>H<sub>4</sub>O<sub>6</sub>N<sub>2</sub>. Both substances are oxidation derivs. of histidine and have the properties described by Mörner. Attention is directed to the fact that the latter substance must contain either 2 or 4 atoms of H instead of 3 (as found by Mörner) if it consists of a simple mol.

C. J. WEST.

Action of aldehydes upon urease. M. JACOBY. *Biochem. Z.* 85, 358-64(1918); *Physiol. Abstracts* 3, 224.—AcH hinders the action of urease as is already known. AcH.HCN augments its activity.

C. J. WEST.

Mutual action of calcium and magnesium salts on their diffusion through colloids (TADOKORO) 2. Proteinogenous amines (KOESSLER, HANKE) 10. Constitution of the true nucleic acids (FEULGEN) 10. Sitosterol (WINDAUS, RAHLEN) 10.

LOEB, J.: **Forced Movements, Tropisms, and Animal Conduct.** Philadelphia: J. B. Lippincott Co. \$2.50.

### B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Experiments on the production of antipoliomyelitis serum in rabbits. E. T. H. TSEN. New York. *J. Immunology* 3, 213-7(1918).—Rabbits could not be immunized with poliomyelitis virus to produce serum which could neutralize the effect of the virus.

GEO. T. CALDWELL.

Tables for use in blood analysis. FLORENCE HULTON-FRANKEL. New York. *J. Lab. Clin. Med.* 3, 548-52(1918).—In order to lessen the amt. of calculation necessary in hospital labs. where routine exams. are made, a series of tables were prepd. whereby the results of blood analysis can be read directly, when certain standard methods are used for detn. of non-protein N creatine, sugar, urea or uric acid.

G. T. C.

A simple mounting for the carbon dioxide apparatus of Van Slyke. W. MORSE AND L. L. LANDENBERGER. Chicago. *J. Lab. Clin. Med.* 3, 557-8(1918).—The 50 cc. bulb of the apparatus sits in a clamp which has four jaws generously supplied with thick-walled rubber tubing and the bulb is held in place by means of a hook operated by a special spring at its base, which draws the hook into firm contact with the bulb. The leveling bulb is supported by an ordinary ring fastened to the same ring stand which is used to hold the apparatus proper. From the sides of the ring, 2 in. of metal are cut away for the purpose of admitting the leveling bulb. The method is applicable likewise to the micro-apparatus.

GEO. T. CALDWELL.

*Meningococcus agglutinating serum.* A method of increasing the yield from the rabbit. A. S. G. BELL AND MISS I. M. HARMER. *Lancet* 1918, I, 705-6.—By means of intermittent bleeding a 1500 g. rabbit gave 125 cc. of highly specific serum of a titer of 1:1200, as much as 20 cc. of blood being removed at a single bleeding.

GEO. T. CALDWELL.

Titration of free hydrochloric acid in stomach contents in the presence of dissociated organic acids by means of the addition of alcohol. G. KELLING. *Berl. klin. Wochschr.* 50, 334-6(1918); *Physiol. Abstracts* 3, 380.—The method gives good results.

JULIAN H. LEWIS.

The estimation of nitrogen in the urine by the Kjeldahl method. C. AND M. DEHME. *Berl. klin. Wochschr.* 55, 401-2(1918); *Physiol. Abstracts* 3, 385.—In the present shortage of chemicals the micro-method is urged.

JULIAN H. LEWIS.

Studies in preservatives of biological products. The effects of certain substances on organisms found in biological products. M. H. NEILL. Washington, D. C. U. S. P. H. S., Hyg. Lab., *Bull.* 122, 37-46(1918).—When certain organisms, occurring as contamination of biol. products, were exposed to dilns. of phenol 1:110 and to a soln. of formaldehyde 1:50, a decided variation in the resistance of the organisms was noted. The resistance of the organisms differed both with the disinfectant used and in relation to each other and also as compared with typhoid bacilli. A method of testing the practical value of a substance for the destruction of such chance contaminating bacteria is presented. Trikresol and formaldehyde, when used in amts. usually recommended and tested in serum or broth, were inefficient germicides against certain nonspore-bearing organisms previously isolated from commercial biol. products. Amts. of these substances large enough to have an antiseptic action against some of these organisms used in the test would probably either be deleterious to the



products, or of undue toxicity. These expts. emphasize the necessity for scrupulous care in the prepn. and handling of biological products and demonstrate the fact that the use of preservatives does not insure the sterility of the finished products.

JULIAN H. LEWIS.

**Abderhalden's polarimetric method.** ALFREDO SORDELLI. *Anales soc. quim. Argentina* 6, 31-4(1918).—S. used a no. of samples of placenta peptone of varying origin in tests by the Abderhalden method. With the exception of a Grüber placenta peptone the samples gave results comparable with those mentioned as typical by Abderhalden when tested against sera of pregnancy. The polarimetric readings when the samples were tested against normal sera were also comparable with those given by Abderhalden. Polarimetric readings obtained in the case of sera of cancer, tuberculosis and typhus were of the same order of magnitude as those obtained with sera of pregnancy; these readings were in all cases well above the max. mentioned by Abderhalden as possible with an antigen and non-corresponding serum. The Abderhalden method is lacking in specificity in many instances at least and its diagnostic value is to be doubted.

H. S. PAINE.

**Simulation of albuminuria.** ED. JUSTIN-MUELLER. *J. pharm. chim.* 18, 201-4 (1918).—The use of Maurel's reagent, modified by increasing the 3%  $\text{CuSO}_4$  soln. to 10%, is recommended. Upon mixing the white of  $\sim$  eggs with 1 l. of non-albuminous urine, the times required for the appearance of a white ring were observed when the following reagents were added: Glacial  $\text{AcOH}$ ; the same satd. with  $\text{NaCl}$ ; glacial  $\text{AcOH}$  35 cc., plus 33%  $\text{NaOH}$  15 cc.; Maurel's reagent (33%  $\text{NaOH}$  25 cc., 3%  $\text{CuSO}_4$  5 cc., glacial  $\text{AcOH}$  70 cc.); the reagent modified. The speed of the formation of the ring increased in the ratio of 1 (= 1200 seconds for  $\text{AcOH}$ ):1:8:16:40. S. WALDBOTT.

A new illuminator for microscopes (SILVERMAN) I.

### C. BACTERIOLOGY.

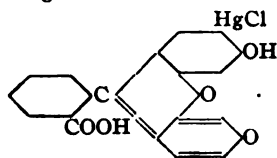
**An improved method of sterilization of infected teeth.** MONTGOMERY LAROCHE. *J. Nat. Dental Assoc.* 5, 1142-4(1918).—A mixt. of equal vols. of distd.  $\text{H}_2\text{O}$  and 95% alc. is satd. with beachwood creosote and  $\text{H}_3\text{BO}_3$ . The resulting soln. is used as an electrolyte with a Pt-Ir electrode in electrolytic medication.

JOSEPH S. HEPBURN.

**Effect of cotton stoppers used in dilution blanks on numerical bacterial count and other practices in the technic of bacteriological laboratories.** ROY S. DEARSTYNE. *J. Dairy Sci.* 1, 512-6(1918).—It appears from the results that about 8% of the organisms adhere to the cotton stopper on shaking the blank. Organisms were found on strands of the cotton. *B. subtilis* did not generally survive sterilization ( $200^\circ$  for 1 hr.) in the center of cotton stoppers. Shaking bottled milk with the original cap up and inverted gave satisfactory agitation for a representative sample. No difference was found in the propagation of bacteria in glass or paper containers.

H. A. L.

**Urinary antiseptics.** The secretion of antiseptic urine following the intravenous administration of an organo-mercury phthalein derivative. EDWIN G. DAVIS, EDWIN C. WHITE AND ROBERT ROSEN. Johns Hopkins Hospital. *J. Urol.* 2, 277-98(1918).—This paper is a discussion of the chemistry, antiseptic properties, toxicity and excretion of chloro-Hg-fluorescein, a synthetic compd. (cf. *C. A.* 12, 954, 2014) formed by the introduction of one atom of Hg into the fluorescein mol. It has the probable formula



It is readily sol. in dil. NaOH or Na<sub>2</sub>CO<sub>3</sub>. After intravenous injection it is excreted by the kidney as rapidly as is phenolsulfonephthalein. The excretion is accompanied by a cleavage in the organism into fluorescein and some form of Hg combination. In either acid or alk. urine (*in vitro*) chloro-Hg-fluorescein will inhibit the development of the colon bacillus or *Staphylococcus aureus* in a diln. at least as great as 1:10,000. It is more efficient in acid than in alk. urine. The intravenous administration of minute doses (5-10 mg.) to rabbit, dog or man will cause the secretion of antiseptic urine. The antiseptis-producing dose is well within the toxic limit. The single lethal dose for rabbit and dog is approx. 20 mg. per g. of body wt. Half this dose may be given daily to dogs without any ill effects. The computed lethal dose for man is about 140 times the antiseptis-producing dose. No clinical value is yet claimed for this drug, although work has been started to det. this.

JULIAN H. LEWIS.

**Urinary antiseptis.** The secretion of antiseptic urine following the intravenous administration of acriflavine and proflavine. Preliminary report. EDWIN G. DAVIS AND EDWIN C. WHITE. Johns Hopkins Hospital. *J. Urol.* 2, 299-308(1918).—Acriflavine and proflavine retain their antiseptic action when dild. in urine, and in this respect differ from many standard antiseptics. Although strongly antiseptic in both acid and alk. urine, these drugs display a relative weakness in inhibiting the colon bacillus in acid urine. They are efficient in very high diln., however, against colon bacillus in alk. urine, and against the staphylococcus in urine of any reaction. When administered by mouth or intravenously to rabbits and dogs, acriflavine and proflavine appear in the urine in less than 1 hr., and continue to be excreted for about 4 hrs. Quant. detns. of the % of excretion have not been made. Following the intravenous administration of 10-mg. doses of acriflavine to rabbits the urine is rendered antiseptic between the 2nd and 4th hrs. The exact time limits have not been detd. Corresponding doses by mouth did not produce antiseptic urine. Following the same dose per kg. to dogs, no antiseptic action in the urine could be demonstrated. This may be due to the acidity of the dog urine, as compared with the alkalinity of the rabbit urine. Rabbits tolerate 25-mg. doses of acriflavine without apparent effect, but do not survive 50-mg. doses (intravenously). No apparent effect upon 10-kg. dogs was observed following 100-mg. and 200-mg. doses given intravenously. Preliminary expts. indicate that acriflavine may prove to be of value for internal use in alk. infections of the urinary tract.

JULIAN H. LEWIS.

**Urinary antiseptis.** The antiseptic properties of normal dog urine. EDWIN G. DAVIS AND R. F. HAIN. Johns Hopkins Hospital. *J. Urol.* 2, 309-20(1918).—Normal dog urine, obtained by aseptic catheterization, shows a distinct antiseptic action, which is particularly marked against organisms of the colon-typhoid group, less effective against *Staphylococcus aureus*, and entirely inert against at least one strain of *Staphylococcus albus*. This antiseptic action is not const. for all dogs, nor for the same dogs on all occasions. It was exhibited, however, by the urine of one dog in 29 out of 30 catheterizations. Dog urine, inoculated with the colon bacillus and incubated, may become sterile during as short a period as 6 hrs. The antiseptic action of dog urine bears no relationship to the H<sup>+</sup> concn., nor is it influenced by the action of various extractives of the urine. Of those specimens of dog urine which act as suitable culture media, some may be rendered unsuitable by passage through a Berkefeld filter.

JULIAN H. LEWIS.

**The effect of ether on tetanus spores and on certain other microorganisms.** H. B. CORBITT. U. S. P. H. S., Hyg. Lab., *Bull.* 112, 47-8(1918).—In order to hasten the reduction in the no. of living bacteria which occurs when ground vaccine virus is exposed to the action of glycerol it has been recommended that the vaccine be treated with Et<sub>2</sub>O vapor. A method more drastic than that recommended is used to test

the action of  $\text{Et}_2\text{O}$  against tetanus spores. Treatment of tetanus spores with  $\text{Et}_2\text{O}$  at  $40^\circ$  for 48 hrs., or intimate mixing of  $\text{Et}_2\text{O}$  and tetanus spores up to 2 wks., failed to kill them. Therefore  $\text{Et}_2\text{O}$  cannot be depended on to kill spores in vaccine virus.

JULIAN H. LEWIS.

#### D. BOTANY.

CARL L. ALSBERG.

Present state of the anthocyanin question. J. BEAUVERIE. *Rev. gén. sci.* 29, 572-9(1918). E. J. C.

The dynamics of photosynthesis. W. J. V. OSTERHOUT AND A. R. C. HAAS. *J. Gen. Physiology* 1, 1-16(1918).—See *C. A.* 12, 2597. E. H.

The influence of certain added solids upon the composition and efficiency of Knop's nutrient solution. E. H. TOOLE AND W. E. TOTTINGHAM. *Am. J. Botany* 5, 452-61(1918).—In Knop's nutrient soln. the growth of barley was increased by the addition of  $\text{Fe}(\text{OH})_3$ , was depressed by the addition of carbon black and was unaffected by  $\text{H}_2\text{SiO}_3$ . Root development was unaffected in each case. The total range in acidity of the cultures was comparatively small; the weight of dry tops was inversely proportional to the H-ion concn. of the soln. A large amt. of the P of Knop's soln. was taken out of soln. by the application of a greater amt. of  $\text{Fe}(\text{OH})_3$ . It is stated there was no evidence of poor P nutrition.  $\text{Fe}(\text{OH})_3$  produced neutrality of the nutrient medium, which may have been a factor contributing to the higher yield.

J. J. SKINNER.

The osmotic concentration of the tissue fluids of phanerogamic epiphytes. J. A. HARRIS. *Am. J. Botany* 5, 490-506(1918).—One of a series of papers dealing with the problem of the physio-chem. properties of vegetable saps in relation to environmental factors and geographical distribution. It was found that the osmotic concn. of the tissue fluids of epiphytic Bromeliaceae, Orchidaceae, Piperaceae, and Gesneraceae is far lower than that of terrestrial vegetation. In the Jamaican montane rain forest where direct comparisons for individual habitats are possible, the epiphytes show from 37 to 60% of the concn. characteristics of herbaceous terrestrial vegetation, and from 28 to 40% of the concn. of ligneous terrestrial vegetation. In the Bromeliaceae, Orchidaceae, and Peperomia of the Piperaceae, the osmotic concn. of the species of the Jamaican montane rain forest is lower than that of the species of the hummocks of subtropical Florida.

J. J. SKINNER.

Stimulation of root growth in cuttings by treatment with chemical compounds. O. F. CURTIS. Cornell Agr. Expt. Sta., *Memoir* 14, 78-135(1918).—It is shown that  $\text{MnO}_2$ ,  $\text{MnSO}_4$ ,  $\text{Al}_2\text{Cl}_6$ ,  $\text{FeCl}_3$ ,  $\text{FeSO}_4$ ,  $\text{H}_3\text{BO}_3$  and  $\text{P}_2\text{O}_5$  have a slight stimulating effect on the rooting of cuttings. Solns. of the nutrient salts were injurious in most cases to root growth in cuttings. Root growth of *Ligustrum ovalifolium* in solns. was stimulated by  $\text{KMnO}_4$  in concns. varying from 0.5 to 2% when treated for 24 hours in concns. of 0.05 to 0.5% when treated for 5 days and in concns. of 0.0001 to 0.16% with continuous treatment. Immature twigs can be caused to absorb sucrose and store it in such form as to be available as a food supply for increased root development. Mature twigs are but slightly benefited or may even be somewhat injured by treatment with sucrose. Any injury accompanying treatment with sugar is due to resulting products formed by bacterial or fungus action.

J. J. SKINNER.

Hastening the germination of Bermuda grass seed by the sulfuric acid treatment. W. E. BRYANT. *J. Am. Soc. Agron.* 10, 279-8(1918).—Bermuda grass seed were treated with  $\text{H}_2\text{SO}_4$  for periods varying from 5 to 60 min. Lots treated for 10 min. gave the quickest germination; 95% of the total germination was obtained at the end of the 4th day.

J. J. SKINNER.

A comparative study of salt requirements for young and for mature buckwheat plants in sand cultures. J. W. SHIVE. *Soil Science* 6, 1-32(1918).—Detailed data of the work given in C. A. 12, 1397. Cf. C. A. 10, 1660; 12, 2089. J. J. SKINNER.

The interconnection of economic botany and chemical industry (WHEELER) 18.

## E. NUTRITION.

### NORMAL.

PHILIP B. HAWK.

Is the amount of calcium usually given in dilutions of cow milk injurious to infants? L. E. HOLT, A. M. COURTNEY AND H. L. FALES. Babies Hospital and Rockefeller Institute, New York. *Am. J. Dis. Children* 16, 52-6(1918).—Bosworth, Bowditch and Giblin recommend "decalcified" milk for infants to aid the resorption of fat and to avoid constipation with subsequent "blowup." It is shown that the fat retention of infants fed with simple milk mixtures is very good, indeed better than the fat retention obtained by these authors with their decalcified milk. S. AMBERG.

Is the amount of calcium usually given in dilutions of cow milk injurious to infants? A. W. BOSWORTH, H. I. BOWDITCH AND L. A. GIBLIN. *Am. J. Dis. Children* 16, 265-7(1918).—This paper is a reply to the criticisms of Holt, Courtney and Fales (preceding abstract). S. AMBERG.

## F. PHYSIOLOGY.

ANDREW HUNTER.

Variations in the lipid ("fat") content of the blood of infants under certain nutritional conditions. W. M. MARRIOTT AND W. R. SISSON. *Am. J. Dis. Children* 16, 74-82(1918).—The total lipoids of the blood were detd. by Bloor's nephelometric method. A few normal cases were studied. The greater number of the infants was suffering from more or less severe nutritional disorders. The cases were grouped according to their nutritional state. Seven, weighing 85-100% of av. normal wt., showed 0.57-0.81% fat in the blood, with an av. of 0.68%; 7, with 70-85% of normal wt., had 0.52-0.83% (av. 0.66%); 13, weighing 60-70% of the normal, had 0.5-1.0% (av. 0.69%); 25, weighing below 60% of the normal, had 0.52-0.96% (av. 0.68%). The fat content of the blood, therefore, is independent of the state of nutrition of the infant. Thirteen cases gaining in wt. had 0.64-1.0% fat in the blood, av. 0.76%. Of these 5 were breast-fed, giving 0.77-1.0%, av. 0.82; 8 were artificially fed, giving 0.64-0.84%, av. 0.72. In 14 cases with stationary wt. was found 0.5-0.76%, av. 0.64. In 25 cases losing wt. the figures were: 0.52-0.96, av. 0.66%. Eight infants on a fat-free diet had 0.52-0.7%, av. 0.63%. In 10 cases the blood was taken during starvation, and contained 0.52-1.02% fat, av. 0.75%. In 5 cases with acidosis (not due to acetone "bodies") the figures were 0.67-0.83, av. 0.74%. S. AMBERG.

Normal isohemagglutinins: their occurrence in human blood and their relation to blood transfusion. S. W. SAPPINGTON AND JAMES S. SEITZ. Hahnemann Medical Coll., Phila. *Hahnemannian Monthly* 53, 536-45(1918).—These workers adopt for human blood the following classification which has been used by some but not all previous investigators. *Group 1*: Its serum agglutinates corpuscles of groups 2, 3 and 4; its corpuscles are not agglutinated by any sera. *Group 2*: Its serum agglutinates corpuscles of groups 3 and 4; its corpuscles are agglutinated by sera of groups 1 and 3. *Group 3*: Its serum agglutinates corpuscles of groups 2 and 4; its corpuscles are agglutinated by sera of groups 1 and 2. *Group 4*: Its serum does not agglutinate any corpuscles; its corpuscles are agglutinated by sera of groups 1, 2, and 3. Study of the blood of 163 medical students showed the relative frequency of the groups to be: group 1 39.3%, group 2 42.9%, group 3 12.9%, group 4 4.9%. J. S. HEPBURN. J

**A gradient of metabolism in the intestinal muscle.** W. C. ALVAREZ. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 579(1918).—Gradients in rhythmicity, irritability and latent period are best explained by the presence of an underlying gradient of metabolism. "Child has shown that the regions of high rates of metabolism and faster oxidation suffer more from the action of weak solns. of KCN than do the regions of slower rates." The action of KCN soln. (1 to 1,300,000) on five segments from different parts of the intestine, caused a marked loss of tone and rhythmicity in the duodenum and jejunum, while the ileum and colon are much less affected. "Some 75 drugs have been tried out and several show similar differences in their action on different parts of the gut." It is concluded that these observations, together with those of Child, furnish proof of the presence of a metabolic gradient down the intestine. It is suggested that some of the emetics and purgatives owe their effects to alterations in this gradient.

G. MCGUIRE.

## G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**The curative and prophylactic value of vaccines in pertussis.** L. H. BARENBERG. *Am. J. Dis. Children* 16, 23-9(1918).—Pertussis vaccine even in large dosages did not have any curative effect. It has some prophylactic potency.

S. AMBERG.

**Further report on the use of pertussis vaccine controlled by the complement fixation test.** E. J. HUENKENS. Univ. Minn. *Am. J. Dis. Children* 16, 30-3(1918).—Only fresh pertussis vaccine (that is, vaccine less than 1 week old) without preservative should be used. Such vaccine when given in large doses leads to demonstrable antibody formation. It is most effective as a prophylactic.

S. AMBERG.

**A protective therapy for varicella and a consideration of its pathogenesis.** A. F. HESS AND L. J. UNGER. *Am. J. Dis. Children* 16, 34-8(1918).—It is possible to bring about immunity to chicken pox by means of an intravenous injection of the contents of the vesicles.

S. AMBERG.

**Active immunization of infants against diphtheria.** A. B. ZINGHER. New York City Dept. of Health. *Am. J. Dis. Children* 16, 83-102(1918); cf. *C. A.* 12, 161.—All infants below 12 and if possible below 18 months of age should be actively immunized with three doses, each 1.0 cc., of toxin-antitoxin. These injections should be given irrespective of the Schick test the infants may show at the time of immunization. The injections are given subcutaneously one week apart. The mixt. should be slightly toxic and should represent about 85% of an L + to each unit of antitoxin.

S. A.

**The effect of injections of pituitary solutions on the urinary output in a case of diabetes insipidus.** S. W. CLAUSEN. Washington Univ., St. Louis. *Am. J. Dis. Children* 16, 195-204(1918).—The observations were made on a boy 9 1/2 years of age. Subcutaneous injections of pituitrin diminish the output of urine markedly. The hourly rate of Cl elimination is always reduced after the injections, that of urea only slightly, if at all. The hourly excretion of creatinine, uric acid and titratable acids is only slightly reduced. When the hourly ingestion of water and NaCl or urea is maintained at a const. high level, the elimination of urea is uninfluenced by the injection of pituitary soln., whereas the Cl elimination is considerably, and the water elimination very much, diminished.

S. AMBERG.

**The normal agglutinins for different kinds of pathogenic bacteria in the serum of cold-blooded animals.** M. TAKENOCHI. Univ. Chicago. *J. Infect. Dis.* 23, 393-5(1918).—The normal serums of various species of turtles show fairly high agglutinating values for certain bacteria which are pathogenic for warm-blooded animals and do not grow readily at the body temp. of cold-blooded animals. These facts are theoretically interesting, because, according to the prevalent hypothesis, the occurrence of normal agglutinins is due to a slight unrecognized infection or to the absorption of some sp.

toxic substance from the intestinal canal during life. This seems improbable, especially in the case of cold-blooded animals. JULIAN H. LEWIS.

**Cytolytic action of normal and immune serum on infusoria.** M. TAKENOUCHI. Univ. Chicago. *J. Infect. Dis.* 23, 396-414(1918).—The serums of man, horse, sheep, hog, beef, guinea pig, rabbit, pigeon, frog and turtle were tested to det. the smallest amt. which is necessary to kill the same no. of infusoria (*Paramecium caudatum*). Dilns. were made with 0.6% NaCl. The toxic action of serum consists in depression of motility, discharge of trichocysts, swelling and finally disintegration of the bodies of paramecia. Colpoda is somewhat more resistant than Paramecium. The acting substance or substances can be adsorbed by various adsorbents. The toxic activity disappears when serum is heated at 56° for about 1½ hr. (warm-blooded animals) or at 53° for 20 min. (cold-blooded animals). The reactivation was tested with fresh normal guinea-pig serum as complement source. Fresh guinea-pig serum contains relatively more complement than is required to combine with its own amboceptor. A phenomenon similar to the so-called "complement deviation" was observed. Evidently the action of serum on paramecia is analogous to bacteriolysis and hemolysis. Inactive serum of cold-blooded animals (frog and turtle), however, cannot be complemented by the normal complement either of guinea pig or of frog serum. Immune rabbit serums contain about 10-15 times as much amboceptor as the normal rabbit serum. The normal serums of cold-blooded animals have a very much stronger activity than the serum of warm-blooded animals. The morphol. and physiol. alterations of paramecia observed under the influence of normal and immune serums lead the authors to conclude that the action of serum on infusoria is typically serologic—a beautiful example of the mechanism and nature of cytotoxicity. JULIAN H. LEWIS.

**Lysis and agglutination of red corpuscles of warm-blooded animals by the normal serum of cold-blooded animals.** M. TAKENOUCHI. Univ. Chicago. *J. Infect. Dis.* 23, 514-25(1918).—The normal serums of different species of turtle contain different amts. of lysins and agglutinins for different kinds of corpuscles of warm-blooded animals. The normal serum of turtle (*Chrysemys picta*) contains several lysins and agglutinins for erythrocytes of warm-blooded animals. The normal lysins of the turtle serum lyses the red corpuscles of warm-blooded animals even at 0°. The red corpuscles of rabbit blood hardened by Hayem's soln. cannot be lysed by the turtle serum, unless the fixation is incomplete. For the agglutination of hardened corpuscles a certain amt. of electrolyte is necessary. Reactivation of inactive turtle serum by normal complement of guinea pig or frog was tested with negative results. The agglutinins of turtle serum for erythrocytes of warm-blooded animals have varying degrees of heat lability. Red corpuscles of some species of the tested animals can absorb agglutinins and lysins for erythrocytes of other animals. The specificity of normal agglutinins and lysins in turtle serum for erythrocytes of warm-blooded animals seems not to be so strict as claimed by Noguchi in the serum of *Limulus polyphemus* and *Musterus canis* for erythrocytes of different cold-blooded animals. However, the serum of turtle seems to contain not only a multiplicity of agglutinins, but also a multiplicity of lysins for red corpuscles of warm-blooded animals. JULIAN H. LEWIS.

**Studies on the biochemistry and chemotherapy of tuberculosis.** XVIII. The use of gold salts in treatment of experimental tuberculosis in guinea pigs. LYDIA M. DEWITT. Chicago. *J. Infect. Dis.* 23, 426-37(1918).—Gold salts, which are highly bactericidal for tubercle bacilli *in vitro*, are not efficacious in the treatment of exptl. tuberculosis in guinea pigs. Chem. analyses of the organs of the animals receiving Au over long periods of time demonstrate that there is no sp. affinity of Au for tuberculous tissues and that the Au in the tissues is probably fixed in the tissue cells in such a form that it cannot inhibit the growth of the tubercle bacillus nor the development of the

tubercle, even when its concn. in the tissues is more than sufficient to cause complete inhibition in the test-tubes.

JULIAN H. LEWIS.

**Liberation of antibodies on injection of foreign proteins.** SIEGFRIED F. HERRMANN. Univ. Minn., Minneapolis. *J. Infect. Dis.* 23, 457-69(1918).—In rabbits sensitized with streptococci a definite liberation of sp. opsonins and agglutinins follows the injection of foreign protein. A similar rise in sp. opsonins also occurs in rabbits sensitized with meningococci. Foreign protein injections have no effect on antibodies in typhoid immune rabbits. In suitable rabbits, which do not readily produce lysins against sheep corpuscles, the injection of foreign protein within 10 days after the injection of antigen is followed by a marked liberation of specific lysins. A variety of foreign proteins can be used. Human serum, typhoid vaccine, human ascitic fluid, and guinea pig serum proved equally efficacious.

JULIAN H. LEWIS.

**The complement fixation test for syphilis (modified Wassermann).** M. H. NEILL. U. S. P. H. S. *Public Health Report Reprint* No. 483.—Coming from the Government laboratories as this does, the article constitutes a long desired source of a standard description of the technic of the Wassermann reaction. It describes in detail the app., the prepn. and testing of the reagents used, and the method of performing the test itself.

JULIAN H. LEWIS.

**Ohmmeter for measuring the electrical resistance of blood. Clinical applications.** CHARLES RICHET, P. BRODIN, G. NOIZET AND F. SAINT-GIRONS. *Compt. rend.* 167, 415-8(1918).—The resistance of blood in a rather large capillary tube was measured by the method of Kohlrausch. Blood from six normal persons gave results ranging from 180 to 228, average 200, cm.-ohms. Seven diseased persons with blood deficient in hemoglobin and of varying density gave resistance figures from 106 to 168 cm.-ohms. The hemoglobin content, density and elec. resistance vary directly. The figures for 8 normal dogs ranged from 175 to 225, average 190. Blood of a nearly starved dog gave 134, which after two days of liberal feeding rose to 146 and in four days to 159 cm.-ohms. In dogs subjected to profuse bleeding the elec. resistance was lowered; the total average of three dogs on the 6th, 7th, 9th, 12th and 20th days after bleeding was 121 cm.-ohms. The elec. resistance of blood furnishes a rapid accurate method which may be substituted for counting erythrocytes.

L. W. RIGGS.

**Elimination of iron and its distribution in the liver and spleen in experimental anemia.** IL. H. DUBIN AND R. M. PEARCE. *J. Exp. Med.* 27, 479-85; *Physiol. Abstracts* 3, 246; cf. *C. A.* 11, 1684.—A chronic exptl. anemia produced in dogs by infecting them with *Trypanosoma equiperdum* was studied. No increased elimination of Fe was observed, whereas storage occurred in the liver and spleen. These results are similar to those found in the study of transient exptl. anemia. The expt. therefore failed to reproduce the changes of Fe metabolism seen in certain of the chronic hemolytic anemias of man. The Fe content of the urine was unchanged after a bile duct-ureter anastomosis had been made. Such animals also showed storage of Fe in the spleen.

C. J. WEST.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

**A note on the treatment of malaria by disodo-luargol.** W. A. MURRAY AND R. W. H. ROW. *Lancet* 2, 355(1918).—Disodo-luargol is not a specific for malaria. There are several reasons, both clinical and technical, to render it far less suitable for use than quinine.

GEO. T. CALDWELL.

**Procaine for dental operations.** STEPHEN P. MALLETT. *Dental Cosmos* 60, 966-72(1918).—A discussion of the requisite properties of a local anesthetic, and of the manner in which a mixt. of procaine and adrenaline satisfies these requirements.

JOSEPH S. HEPBURN.

**Industrial aniline poisoning in Massachusetts.** THOMAS F. HARRINGTON. Boston. *Bost. Med. and Surg. J.* 179, 497-500(1918).—Pure aniline does not cause poisoning, but the aniline used industrially contains *o*-, *p*-, and *m*-toluidines and xylydine which are poisonous. The most pronounced symptoms of acute aniline poisoning are dyspnea and cyanosis. The blood changes produced are characteristic. It is turbid and brownish, and shows a spectroscopic band that resembles that of methemoglobin.

JULIAN H. LEWIS.

**Acriflavine in the treatment of gonorrhea. An experimental and clinical study.** EDWIN G. DAVIS AND B. E. HARRELL. Johns Hopkins Hospital. *J. Urol.* 2, 257-76 (1918).—Acriflavine was found to possess a high diffusibility, and to be antiseptic in urine in higher diln. than any other diffusible dye studied. For the colon bacillus it is more antiseptic in alk. than in acid urine, while for the *Staphylococcus aureus* it is equally antiseptic in both. Acriflavine will inhibit the development of the gonococcus in a diln. of at least 1:300,000 (has at least 600 times the strength of protargol). An exptl. and clin. study of this drug in the treatment of gonorrhea showed that it will penetrate through the submucosa of the urethra and bladder. It is non-toxic and only slightly irritating to the urethral mucous membrane. The av. duration of a gonorrhea under this treatment is distinctly less than with the usual methods. In an occasional case it seems without effect upon the course of the disease. J. H. LEWIS.

**Phenols as preservative of antipneumococcus serum. A pharmacological study.** CARL VÖGTLIN. Washington, D. C. U. S. P. H. S., Hyg. Lab., *Bull.* No. 112, 5-13 (1918).—The use of large vols. of serum (50-100 cc.), preserved with phenol and trikresol, given intravenously, in the treatment of pneumonia means the introduction into the circulation of as much as 0.5 g. of phenols at a single injection. Studies of the probable toxic effect of this procedure show that the serum is not toxic if the concn. of trikresol or phenol is no more than 0.5%. It is recommended, however, that these injections be made very slowly.

JULIAN H. LEWIS.

**Possibilities of increasing milk and butter-fat production by the administration of drugs.** ANDREW C. McCANDLISH. *J. Dairy Sci.* 1, 475-86(1918).—The various ways in which drugs might influence activity of the udder are discussed. Two sets of expts. were run, using the drugs: alc., castor oil, pituitrin, pilocarpine, physostigmine, aloes, calomel, nux vomica, Epsom salts, and common salt. Tables of results are given. The above drugs used cannot be relied on to induce an increase in the production of milk or % butter fat. Pituitrin and castor oil caused a decrease in the % of butter fat. There was a wide variation in the individual response of cows to the drugs.

LILLIAN OFFUTT.

**Pathology and treatment of trinitrotoluene poisoning, and the action of other poisons which affect fat metabolism.** A. G. R. FOULERTON. *J. Roy. Army Med. Corps* 30, 535-52; *Physiol Abstracts* 3, 337.—T. N. T. is compared with tetrachloroethane,  $\text{CHCl}_3$ , ether, D. N. T. and P.

C. J. WEST.

An institute for coöperative research as an aid to the American drug industry 17.

#### I. ZOÖLOGY.

R. A. GORTNER.

**Evidence of toxic action of ovaries of gar.** C. W. GREENE, *et al.* *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 558(1918).—The toxicity of gar ovaries was tested by feeding fresh ovaries to chickens, white rats, cats, and dogs. For chickens "single feed of 5 g. was the minimum toxic dose producing just perceptible symptoms;" if large amts. were fed death was produced in 3 or 4 days. "White rats died after eating quantities as small as 5 g. of gar ovary." Cats and dogs vomited the ovaries within two and a half hours, usually earlier. This is a preliminary paper; organic tests and chemical sepsns. are being carried out.

G. MCGUIRE.



## 12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

The composition of the juice of rhubarb stems. BESSON. *Mitt. Lebensm. Hyg.* 9, 231 (1918).—Max. and min. values are given for regular detns. including  $\text{SO}_2$ ,  $\text{P}_2\text{O}_5$ ,  $\text{NH}_3$ , oxalic acid, and tannin on 7 juices. B. advises against over-indulgence of rhubarb because of the oxalic acid content.  
H. A. LEPPER.

Dried vegetables and canned vegetables. BALLAND. *Compt. rend. acad. agr. France* 4, 902-7 (1918).—Dried vegetables were first introduced in the French army in 1852. Analyses are given of the following dried vegetables imported from the United States: red beets (1 sample), carrots (3), cabbage (2), julienne (2), turnips (2), onions (2), potatoes (2), soup mixt. of carrots, celery, cabbage, turnips, onions and potatoes (2). Analyses are also given of a number of canned vegetables and mixts. of vegetables. Tables showing the amts. of  $\text{H}_2\text{O}$  drained from various canned vegetables and the water content of the drained vegetables are presented.  
ALBERT R. MERZ.

Forms of adulteration of roasted whole coffee. G. ISSOGLIO. *Turin. Giorn. farm. chim.* 64, 337-47.—Analysis of different grades of coffee of varying origin showed that the loss of wt. of freshly roasted coffee, when heated at  $100-110^\circ$  for 3 hrs. did not as a rule exceed 1.5%; this loss of wt. in the case of roasted coffee which had been exposed to the air for several days never exceeded 4%. Loss of wt. in excess of 4% is, therefore, indicative of adulteration with  $\text{H}_2\text{O}$ . Expts. in which freshly roasted coffee was treated with 5% solns. of borax and alum, resp., showed that only slightly more  $\text{H}_2\text{O}$  was absorbed by the coffee than in cases where (1) a fine jet of  $\text{H}_2\text{O}$  was sprayed on the coffee in the roaster and (2) the coffee was immersed in  $\text{H}_2\text{O}$ ; the theory that coffee may thus be made to absorb a considerably greater amt. of  $\text{H}_2\text{O}$  than by treatment with  $\text{H}_2\text{O}$  alone is, therefore, incorrect. Treatment of coffee with borax or alum solns. was readily detected by analysis of the ash; the ash of a sample treated with alum soln. contained 5.99%  $\text{SO}_2$  and 1.99% Al, whereas the normal  $\text{SO}_2$  content varied from 3.09 to 4.48%. The use of a borax soln. tends by its antiseptic action to prevent the growth of molds to the attack of which coffee treated with  $\text{H}_2\text{O}$  alone is very susceptible. Coffee adulterated with  $\text{H}_2\text{O}$  differs considerably in organoleptic and strictly physical properties from normal roasted coffee. The practice of coating coffee with substances such as paraffin, vaseline, etc., for the purpose of producing luster and preventing evapn. of  $\text{H}_2\text{O}$  may be detected by the decrease in the consts. of the "fat" or  $\text{Et}_2\text{O}$  ext. Many varnishes used for coating coffee may be easily detected by the fact that they are readily sol. in cold  $\text{H}_2\text{O}$  and impart a color thereto, whereas roasted coffee which has not been so treated does not color cold  $\text{H}_2\text{O}$ . I. reports the analysis of 1 of these varnishes which contained, among other constituents, a mucilaginous substance (probably glue).  
H. S. PAINE.

Coffee. ANON. *Bull. Dept. Agr. Trinidad and Tobago* 17, Pt. 2, 62-5 (1918).—A report upon *Coffea excelsa* covering selection, cultivation, yield and market value. Analysis of 1 sample gave:  $\text{H}_2\text{O}$  8.5, caffeine 1.20, N 2.18, and ash 3.2%.

R. B. DEEMER.

Citric acid content of Trinidad limes. W. G. FREEMAN. *Bull. Dept. Agr. Trinidad and Tobago* 17, Pt. 2, 72-3 (1918).—Analyses of ordinary limes, seedless limes, spineless limes, and lemons, and also an acid seedling pomelo are reported. It appears that the citric acid content is not the only factor to be taken into account, since expts. by G. A. Jones (*West Ind. Bull.* 12, 506 (1912); cf. *C. A.* 6, 2958) indicate that juice of the highest quality will be produced with low rainfall upon a non-retentive soil. However, under dry conditions smaller fruits may result, with a lower juice content,

and thus the citric acid content of the juice of a given number of fruits from a dry or wet locality may be much the same. R. B. DEEMER.

**Summary of talk on lemon by-products.** C. P. WILSON. *Calif. Citrograph* 3, 140(1918).—About 6% of the crop of the members of Exchange By-Products Co. was shipped to factory at Corona last season. During the 1916-17 season the Exchange By-Product Co. used 5120 tons of lemons; produced 180,000 lbs. citric acid and returned \$10.00 per ton to the growers; this is \$4.00 per ton better than in the previous season. The estd. increase in lemon crop for next 6 years is 114%. Lemon oil and citric acid must form the basis for utilization of lemons not used as fresh fruit. W. V. CRUICK.

**Orange vinegar instead of apple.** *Calif. Citrograph* 3, 257(1918).—Vinegar of good quality was made in a number of tests in the Citrus By-Products Lab. of the U. S. Dept. of Agr., Los Angeles. The process recommended is: Press out the juice from crushed whole fruit. Leave it in a barrel or wooden tub at about 85° F. until fermentation is complete (3-5 days). Strain the juice. Place in barrel generator previously acidified with unsterilized vinegar. Plans for a barrel generator are given. When the vinegar is finished remove it from the barrel, bottle and pasteurize. W. V. CRUICK.

**The use of salicylic acid in tomatoes and preserves.** P. CARLES. *Repert. pharm.* 29, 255-7(1918).—A general argument against the use of salicylic acid in tomatoes and preserves is given. LILLIAN OFFUTT.

**The use of salicylic acid in tomatoes and preserves.** E. CRIBUZEL. *Repert. Pharm.* 29, 285-7(1918).—Polemic with Carles (preceding abstract). L. O.

**The peanut.** W. D. KERLE. *Agr. Gaz. N. S. Wales* 29, 429, 471-9(1918).—Analyses of parts of the peanut plant, digestible nutrients, av. digestibility, analysis of peanut hay, and fertilizing constituents in various parts of the plant. A report is given of the suitability of soils in Australia for peanut production, trials of local and imported American varieties, and the future of the industrial side of peanut production. R. B. DEEMER.

**Contributions to the cryoscopy and refractometry of milk.** J. PRITZKER. *Mitt. Lebensm. Hyg.* 9, 235-6(1918).—The rise of the  $n$  accompanying an increase of acidity in milk (cf. C. A. 12, 835) is due to the dissolving of insol. salts (di- and tri- Ca phosphates). A detn. of acidity is advisable with each refraction reading as a definite relation exists between these 2 detns. H. A. LEPPER.

**The refractometric quantitative analysis of lactose in milk.** L. PANCHAUD AND E. AUERBACH. *Mitt. Lebensm. Hyg.* 9, 236-9(1918).—Work already done along this line is discussed. The methods used and tables of results are given. The refractometric and gravimetric results on the lactose in normal fresh and watered milk agree remarkably, but the refractometric results on old milk acidified are too high, due to the formation of lactic acid and the non-pptn. of albuminoid substances. The refractometric results of the lactose in the abnormal milk of sick cows are too high, due to the change in the milk brought about by the pathol. condition. LILLIAN OFFUTT.

**The influence of the method of preparation on the specific gravity and refractive index of milk serum.** N. SCHOORL. *Utrecht. Chem. Weekblad* 15, 1089-96; *Pharm. Weekblad* 55, 1222-9(1918).—The conclusion reached by van der Harst and Koers (C. A. 12, 2388), that only the  $\text{CaCl}_2$  serum is sensitive enough to detect 10% of added  $\text{H}_2\text{O}$ , is erroneous, due to errors in their calcns. Their results are calcd. from the min. differences in sp. gr. and  $n$  observed after adding 5 and 10% of  $\text{H}_2\text{O}$  to 10 samples, and the max. differences observed in several genuine samples. Calcns. from the av. differences are much more reliable, since they eliminate any error due to erratic max.

and min. differences. Careful study shows that the HOAc serum is fully as sensitive as the  $\text{CaCl}_2$  serum. As a rule, as little as 5% of added  $\text{H}_2\text{O}$  can be detected with either; while 10% can be detected with certainty, especially when the normal data and seasonal variations are known for a given dairy. Cf. following abstract.

JULIAN F. SMITH.

**Reply to the criticism of Schoorl.** J. C. VAN DER HARST AND (MISS) C. H. KOERS. Middelburg. *Chem. Weekblad* 15, 1096-7; *Pharm. Weekblad* 55, 1229-30(1918); cf. preceding abstract.—The authors maintain that their method of calcn.; while not in accord with theory, gives results which agree with the facts met with in practice, since irregular variations in sp. gr. and % of milk serum commonly occur. The  $\text{CaCl}_2$  serum is least affected by these abnormalities.

JULIAN F. SMITH.

**New formula for the calculation of added water in milk.** LESLIE J. HARRIS. *Analyst* 43, 345-7(1918).—A formula is derived by which the % of added  $\text{H}_2\text{O}$  is calcd. on the assumption that the original milk before watering contains the minimum of fat (3%) and solids-not-fat (8.5%). If  $X = 10,000 N/[3 N + 8.5 (100 - F)]$  wherein  $X$  = % of milk of the minimum standard,  $N$  = % of solids-not-fat, and  $F$  = fat then  $100 - X$  = % added  $\text{H}_2\text{O}$ . Using av. values for  $N$  and  $F$  in place of minimum will give the probable  $\text{H}_2\text{O}$  addition.

H. A. LEPPER.

**Studies on the uniformity of heating in the final package method of pasteurization.** B. W. HAMMER AND A. J. HAUSER. *J. Dairy Sci.* 1, 462-74(1918).—The importance of uniform heating of milk in the final package method of pasteurization is shown. There is a great variation in the extent of the heating of the different bottles in the same run. This method as used in the Iowa State College Market Milk Room gave only small variations in the bacterial content and creaming ability of different bottles from the same run, although bottles at the surface were slightly lower in bacterial content and creaming ability. The detn. of creaming ability by means of tubes of milk allowed to stand was found to be a simpler and quicker method for detg. uniformity in heating than the detn. of bacterial content.

LILLIAN OFFUTT.

**The comparison of bacteria counts in whole and skim milk, separator and centrifuge cream.** R. W. LAMSON. *J. Dairy Sci.* 1, 498-507(1918).—The results obtained in these expts. indicate that the number of bacteria is less or only slightly more in sepd. cream than in the whole milk from which it is sepd. Centrifuge cream in closed container showed 6-25 times as many bacteria as original milk. Skim milk has less bacteria than whole milk. There is no definite relation between butter fat and % of bacteria found in cream. These results on sepd. cream and centrifuge cream agree with those obtained by other workers. A common bacteriol. standard for market whole milk and cream is desired.

LILLIAN OFFUTT.

**Production of acid phosphate from creamery waste sulfuric acid.** R. H. CARR. *J. Dairy Sci.* 1, 508-11(1918).—The  $\text{H}_2\text{SO}_4$  used in fat testing in dairy plants is of further value in the production of acid phosphate. A good grade of fertilizer can be made from this acid as it carries N and K which enhance the value of the finished product. Analyses of spent acid and fertilizer produced by it are given.

H. A. LEPPER.

**The establishment and management of the dairy farm in India.** R. KELKAR AND G. K. BAHADUR. Dept. Agr. Bombay, *Bull.* 1917, 86, 1-60; *Bull. Agr. Intelligence* 9, 859-62(1918).—Tables concerning the breed of cow or buffalo, number in herd, av. price, av. wt., time under observation and yield per head of milk in lbs. for yr. are given. Analyses of milk and proportion by wt. of butter fat to milk are tabulated. The processes of making butter from buffalo's milk are discussed. The business aspect of the dairy industry is taken up under the headings of equipment, machinery and

other dead stock, management and labor, dairy buildings, scheme for continuous supply of green fodder, recurring annual expenses, recurring expenditure on feed and maintenance of live stock, and record sheets to be kept on dairy farm of 200 head of cattle.

LILLIAN OFFUTT.

The utilization of horse serum in man's diet. L. LINDET. *Compt. rend. acad. agr. France* 4, 807-10(1918).—The possibilities of the use of the albumin of horse blood as a substitute for the albumin of the white of eggs are discussed. Horse blood contains 8% coagulable albumin, the white of eggs 10%. Various dishes prepd. from the serum are mentioned.

ALBERT R. MERZ.

Composition and feeding value of leaf hay. F. HONCAMP AND E. BLANCK. *Landw. Vers. Sta.* 91, 291-308(1918); *J. Soc. Chem. Ind.* 37, 527A.—Dried leaves of the beech, maple, lime, birch, alder, chestnut, etc., form a valuable feeding stuff; they contain 10-23% of protein, 2-10 of fat, and 17-22 of crude fiber.

L. J. GILLESPIE.

Composition and digestibility of heather and reindeer moss. F. HONCAMP AND E. BLANCK. *Landw. Vers. Sta.* 91, 223-51(1918); *J. Soc. Chem. Ind.* 37, 527A.—Heather meal contains about 7% of protein, 9 of fat, 8 of ash, and 12 to 21 of crude fiber; when prepd. from the leaves and flowers only it has about the food value of hay of poor quality. Reindeer moss has 4% of protein and 2 of fat and is of little value as fodder.

L. J. GILLESPIE.

Potato peelings and heather as coarse fodder for horse. Researches in Holland. P. A. VAN DRIEST. *Tydschrift voor Diergeneeskunde*, Pt. 45, No. 10, 286-8; *Bull. Agr. Intelligence* 9, 846.—Chemical analysis of potato peelings is made. The solanine content is found to be lowered by boiling the peelings for 10 to 15 mins. with a little vinegar in the  $H_2O$ . Boiling also reduces the potash content. It is concluded that potato peelings are good coarse feed for horses. Heather was found to have no influence upon increase in wt. when fed to horses.

LILLIAN OFFUTT.

Alfalfa as a sole feed for dairy cattle. F. W. WOLL. *J. Dairy Sci.* 1, 447-61 (1918).—Cattle fed on mixed rations do better than those fed solely on alfalfa in that there was greater increase in wt. and slightly larger body development; the calves dropped by the heifers were uniformly heavier; and there was greater dairy production. Analyses of the mixed rations and alfalfa feed are given. The economical side of feeding alfalfa is discussed. Tables of the feeding expts. are given.

LILLIAN OFFUTT.

The utilization of corozo wastes as cattle food. CHARLES BRIOUX. *Compt. rend. acad. agr. France* 4, 926-30(1918).—The greater part of the nut of the Tagua palm (*Phytelephas macrocarpa*) is composed of "mannane," a substance intermediate between starch and cellulose. This can be transformed to reducing sugars by dil. boiling acids. The total amt. of these obtainable exceeds 70% of the wt. of the corozo. Analyses are given of powdered corozo and the work of Beals and Lindsey (*C. A.* 11, 173) on its digestibility and feeding value is reviewed.

ALBERT R. MERZ.

The utilization of corozo wastes and of feed-meals for cattle. DECHAMBRE, *et al.* *Compt. rend. acad. agr. France* 4, 919-24(1918).—A discussion of the above paper of Brioux by various members of the academy. Corozo wastes come from toy factories. The corozo seed contains up to 45%  $P_2O_5$  in its ash.

ALBERT R. MERZ.

Importance of salt in rations. JACOB JOFFE. *J. Dairy Sci.* 1, 487-97(1918).—The use of salt is discussed from a historical and physiological standpoint. Analyses of Na and K in feed stuffs as found in Bunge's Physiologic and Pathologic Chemistry are given. The work of Babcock is reviewed. The salt used by calves varies with different feeds. Lack of salt causes pathologic conditions and so loss in wt., vitality, and production of milk.

LILLIAN OFFUTT.

The cottonseed industry of India (ANON.) 27. Possibilities of increasing milk and butter-fat production by the administration of drugs (McCANDLISH) 11H. Effect of cotton stoppers used in dilution blanks on numerical count and other practices in bacteriological laboratories (DEARSTYNE) 11C.

**Sterilizing milk.** M. MUSSINO. U. S. 1,284,751, Nov. 12. Milk is sterilized by heating in an open vessel to a temp. (preferably about the b. p.) above that at which a skin would ordinarily form upon the surface, while a rigid seal, *e. g.*, a metal float, is maintained upon the surface of the milk, to prevent formation of the skin.

**Milk preparations.** P. W. TURNER. Brit. 119,430, June 24, 1918. Milk is curdled by an enzyme, such as is yielded by rennet or pepsin, at a temp. of 80–100° F., but as soon as the curd has reached a flocculent, slightly adhesive condition the action is stopped by cooling the substance rapidly to a temp. of about 45° F. The curds are then allowed to settle and the whey is decanted off. The curds may be beaten, whipped, colored, flavored, or sweetened as desired, or made into a substance resembling ice-cream by heating in an ice-cream freezer. The whey may be reduced by evapn. to about  $\frac{1}{4}$  of its original bulk, and mixed with the curds. In any case, the product is kept at a temp. of about 45° F. until required.

**Preserving fruit juices.** H. C. GORE. U. S. 1,284,187, Nov. 5. Juice from apples, oranges, lemons or other fruits is filtered and mixed with absorbent black, filtered again to sep. the juice from the black, mixed with infusorial earth and again filtered to remove residual traces of the black and finally sterilized.

**Bread.** H. A. KOHMAN, C. HOFFMAN and A. E. BLAKE. U. S. 1,282,867, Oct. 29. Flour which is to be used with yeast in making leavened bread is mixed with about 0.06% of  $\text{NH}_4\text{Cl}$  and 0.12% of  $\text{CaSO}_4$  to reduce the quantity of yeast required.

**Bread.** H. A. KOHMAN, C. HOFFMAN and A. E. BLAKE. U. S. 1,282,868, Oct. 29. About 10% of  $\text{CaSO}_4$  is incorporated with flour to be used in making leavened bread and this mixt. may be further mixed with about 80 times its weight of additional flour in making up the bread dough. The  $\text{CaSO}_4$  serves to promote the growth of yeast.  $\text{Ca}(\text{H}_2\text{PO}_4)_2$  may also be used for the same purpose.

**Sterilizing bread.** H. J. LUEDERS. U. S. 1,282,251, Oct. 22. Loaves of bread, immediately before being wrapped, are passed through a sterilizing zone heated to 60–315° to kill molds on the crust.

**Flavoring butter substitutes.** DE BRUYN and J. DE BRUYN. Brit. 119,052, June 21, 1917. A flavoring material for edible oils and fats is obtained by extg. sol. proteins from nuts, leguminous seeds, etc., and inoculating the ext. with lactic bacteria without the addition of sugars, salts, or fats. The protein ext. may be dried and reconstituted by the addition of  $\text{H}_2\text{O}$  before the inoculation.

**Drying edible pastes.** K. GAMMEL. U. S. 1,284,305, Nov. 12. The pat. relates especially to drying of macaroni paste foods in a closed chamber by the action of air currents.

**Method and apparatus for dehydrating vegetable materials.** G. H. BENJAMIN. U. S. 1,284,218, Nov. 12. The app. is especially adapted for drying vegetable substances by the action of air currents.

**Liquid food from soy-beans.** A. B. MOSKES. U. S. 1,281,411, Oct. 15. Disintegrated soy beans are mixed with  $\text{H}_2\text{O}$  to produce a fluid mass which is then allowed to stand until the  $\text{H}_2\text{O}$  has dissolved sol. constituents of the beans. The mixt. is then heated to remove substances of unpleasant odor and, after cooling, the liquid is strained and the residue pressed to obtain additional liquid. The mixed liquids form a liquid food, resembling milk.

**Fodder.** R. KRON. Swiss 76,805, June 17, 1918. In the prepn. of a fodder for cattle, or an adulterant for food, wood material is treated with  $H_2O$  or a weak  $NaCl$  to fill the pores, and it is then heated for several hrs. at  $90-120^\circ$ . The liquor is then drained off, and the material is dried and ground.

#### 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**Composition of the irrigation waters of Utah.** J. E. GREAVES AND C. T. HIRST. Utah Agr. Exp. Sta., *Bull.* No. 163, 43 pp.(1918).—The sol. salts varied in the various sources of water from 84 to 1250 parts per million. Thirteen contained more than 0.06% sol. salts. The salts in the head waters of most streams studied consist largely of  $CaCO_3$  and  $MgCO_3$ . Analyses of the water from a large number of streams and wells are given. J. J. SKINNER.

**Water on the farm.** VIII. F. B. GUTHRIE. *Agr. Gaz. N. S. Wales* 29, 221-3, 381-6, 551-7(1918).—A continuation of a former article (*C. A.* 12, 2642).  $H_2O$  for human consumption is dealt with. Sources of supply, general characteristics, such as salts present, org. matter, O consumed, and interpretation of analyses and standards are discussed. An analysis of a typical potable  $H_2O$  and of Sydney  $H_2O$  is given. Standard methods of filtration and purification are described. R. B. DREMER.

**Clinical method for the examination of potable waters in the field.** L. C. MAILLARD. *Bull. acad. med.* 79, 198(1918); *Schweiz. Apoth. Ztg.* 56, 374-6(1918).—The advantages of the use of a purely chem. method, especially detn. of  $NaCl$  in the  $H_2O$ , compared with the method of counting colon bacilli, are pointed out. To take into account the natural  $NaCl$  content of a  $H_2O$  supply, its normal amt. should be detd.; any subsequent deviation would render the  $H_2O$  suspect. If time permits, both bacteriol. and chem. methods should be used. S. WALDBOTT.

**Sterilization of water by means of ultraviolet light.** D. VITALI. *Giorn. farm. chim.* 64, 246-8.—V. discusses the principle of sterilization of  $H_2O$  by means of ultraviolet rays from solar radiation and also from a Hg lamp in quartz; he also describes a simple app. by means of which ultraviolet rays from the latter source may be used for sterilization of  $H_2O$  in the home, hospitals, etc. It is recommended that beer, artificial mineral waters, ice, etc., should be produced from  $H_2O$  thus sterilized and that such  $H_2O$  should be used for washing bottles, dishes, etc. H. S. PAINÉ.

RACE, JOSEPH: **Chlorination of Water.** New York: John Wiley & Sons. 158 pp. \$1.50.

**Apparatus for purifying water or sewage.** C. F. WALLACE and M. F. TIERNAN. U. S. 1,283,993, Nov. 5. The material to be purified is treated with  $Cl$ .

**Base-exchanging compounds.** G. RUDORF. Can. 187,428, Nov. 12, 1918. A soln. containing silica and alkali is pptd. by an alk. soln. of alumina, the major portion of the mother liquor is removed and the unwashed ppt. is dried and immersed in water to cause granulation and washing.

**Sewage-sludge.** J. W. PHILLIPS. U. S. 1,284,441, Nov. 12. The solid and semi-solid constituents of sewage are treated with  $H_3PO_4$  in excess of the quantity required to decompose the insol. metallic soaps and carbonates present and the oleaginous substances are then extracted with a solvent. The residue is dried for use as a fertilizer.

**Apparatus for purifying sewage or similar liquids.** W. JONES. U. S. 1,282,587, Oct. 22. The material under treatment is subjected to the action of air or O.

**Fertilizer and other values from sewage sludge.** J. W. PHILLIPS. U. S. 1,284,442, Nov. 12. Solid and semi-solid constituents from sewage sludge are treated with  $H_2PO_4$  in excess of the amt. required to decompose the insol. metal soaps present, the excess free mineral acid is neutralized with phosphate rock to form a composite fertilizer and oleaginous materials are extd. with a solvent such as a light hydrocarbon oil.

**Disinfectant.** A. FRANCK-PHILIPSON. U. S. 1,282,062, Oct. 22. A solidified sol. disinfecting compn. is formed by mixing a tar oil with a fat and boiling with sufficient alkali to neutralize the free acids of the tar oil and saponify or partially saponify the fat. The product forms a stable emulsion with  $H_2O$ . Coconut oil is preferably used, with tar oil and NaOH soln.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

**Soil aldehydes.** JOSHUA J. SKINNER. *J. Franklin Inst.* 186, 449-80, 547-84, 723-41(1918); cf. *C. A.* 12, 2102.—Presence of 25 parts of *heliotropine* per million in the nutrient soln. produced a marked reduction in the absorption of  $K_2O$ ,  $P_2O_5$ , and  $NO_3$  by wheat plants. *Formaldehyde* (20 parts per million) in the nutrient soln. greatly reduced growth of wheat plants and their absorption of  $K_2O$ ,  $P_2O_5$ , and  $NO_3$ . *Paraformaldehyde*,  $(HCHO)_8$ , was fully as harmful as  $HCHO$  to wheat; 25 parts per million in the nutrient soln. materially injured growth, and 50 parts per million was extremely harmful; phosphates tended to ameliorate the harmful effect; "although growth was more normal in the mainly phosphatic solns., showing that there was some action by the phosphates which changed the physiol. effect of paraformaldehyde, the absorption of nitrates by plants growing in the presence of this aldehyde was more normal than the absorption of phosphates or of K." Pot studies were made concerning (1) the influence of *salicylic aldehyde* and of *vanillin* upon the growth of plants (wheat and legumes) in various soils, and (2) the action of fertilizers in ameliorating the harmful properties of these aldehydes. Liming completely overcame the harmful action of both aldehydes; phosphates ameliorated and sometimes entirely overcame the injurious action of salicylic aldehyde;  $NaNO_3$  lessened that of vanillin; and Mn salts changed the physiol. action of both aldehydes. The beneficial action of  $CaO$ ,  $NaNO_3$ , and Mn was probably due to their stimulation of oxidation and related processes in the soil, as a result of which the org. compds. were destroyed or so changed, that conditions became favorable for plant growth. Similar studies of various soils were carried out as field expts. in widely different geographical locations. Both salicylic aldehyde and vanillin persisted and were harmful in acid soils which possessed weak oxidizing activities and low crop-producing powers: both aldehydes were destroyed without injuring the crops when the field had a limestone soil with strong biological activities and good crop-producing powers; liming greatly lessened their harmful action and hastened their destruction. Use of acid phosphate partially overcame the evil effects of salicylic aldehyde, use of  $NaNO_3$  those of vanillin. When salicylic aldehyde had been formed by nature in a soil, addition of phosphate fertilizers and sufficient lime to prevent acidity greatly improved conditions for growth. "Unfertile soils, where due to the presence of harmful aldehydes, can be made productive by good drainage and by the use of lime and certain fertilizers." The drainage increases the aeration and the oxidation in the soil. A bibliography of 85 references is appended.

JOSEPH S. HEPBURN.

**Soil acidity methods.** R. E. STEPHENSON. *Soil Science* 6, 33-52(1918).—A study was made of 6 methods of detg. soil acidity. Truog's method, which makes use of a 0.4 *N* Ba(OH)<sub>2</sub> soln. to neutralize the acidity, gave higher lime requirement. Tacke's method, which makes use of CaCO<sub>3</sub> and H<sub>2</sub>O to bring about the neutralization of the soil acidity, is concluded to have the greatest possibilities. From a study of Tacke's method it is concluded that pure H<sub>2</sub>O is a reliable medium for bringing about the reaction between the acid soil and carbonate. The use of Ca or NaCl hastens the reaction only slightly. Concd. solns. of these salts prevent fermentative reactions, the rate of reaction being somewhat depressed by concd. chlorides. Antiseptics are not needed. The time, rate of aeration and vigor of shaking are the most important factors in the Tacke method. Methods which depend upon the liberation of an acid from its salt do not give total acidity and indicate a lime requirement which depends both upon the soil and salt used.  
J. J. SKINNER.

**Further investigations on the nature of the soil-particles.** I. PAUL EHRENBURG AND J. P. VAN ZYL. *Intern. Mitt. Bodenk.* 7, 90(1917); *Biedermanns Zentr.* 47, 98-100(1918).—A continuation of the work of van Z. (*C. A.* 11, 3363) for the purpose of detg. the influence of the prepn. of the soil-sample on the cohesion of the soil-particles and to ascertain to what extent this influence can be recognized in the mechanical analysis of the sample by the sedimentation process. Air-drying was found to increase the cohesion of the very fine particles only and this effect can presumably be made use of in ascertaining the structure of the soil. A change in the time of shaking may effect the coherence of the particles considerably, so that when information is desired as to the firmness of the individual particles shaking should be avoided. When, however, consideration is not given to the coherence of the particles, shaking of the sample is advantageous as it saves time. The addition of NH<sub>3</sub> has the same advantage.  
ALBERT R. MERZ.

**The decomposition of organic matter in soils.** F. G. MERKLE. *J. Am. Soc. Agron.* 10, 281-302(1918).—The decompn. of leguminous and nonleguminous vegetable material in soil was studied by measuring the quantity of CO<sub>2</sub> produced. The rapidity of decompn. of maple and oak leaves and pine needles in the soil was about the same. Pine shaving decomposed very slowly. The legumes which are high in N show a more rapid rate of decay than cereal straws and litters which are low in N. The decompn. of soy-bean vines was influenced by com. fertilizers. NaNO<sub>3</sub> and basic slag increased, while kainite and KCl decreased the rate of decompn.  
J. J. SKINNER.

**Hydrogen-ion concentration. Soil type. Common potato scab.** L. J. GILLESPIE AND L. A. HURST. *Soil Science* 6, 219-36(1918).—The colorimetric and electrometric methods for detg. H-ion concn. in soils are described. The results secured by the 2 methods on a large number of soils agree within the exptl. error. A study of a large number of typical potato soils showed a close correlation between H-ion concn. and occurrence of potato scab. Soils having a H-ion concn. as low as 5.2 as a rule do not produce scabby potatoes, while soils having exponents much higher produce scabby potatoes. The H-ion exponent of 2 soil types are compared. The typical Caribou loam has an exponent of about 4.8, whereas the Washburn loam is generally less intensely acid; the former produce clean potatoes while the latter produce scabby ones. No standard H-ion exponent of soils for max. crop production is given. Many soils having the exponent 5 are successfully cultivated in potatoes and truck crops without liming and it is stated that the exponent 7, which indicates physico-chemical neutrality can hardly be taken in general as "the rational" end-point in lime-requirement tests.  
J. J. SKINNER.

**The content of amorphous silicic acid in soils.** BÉLA VON HORVÁTH. *Intern. Mitt. Bodenk.* 6, 288-9(1916); *Biedermanns Zentr.* 47, 97-8(1918); cf. *C. A.* 11, 1709.



—The method of Piedzicki (*Mitt. landw. Inst. Univ. Leipzig* 2, 1-54(1901)) for the detn. of amorphous  $\text{SiO}_2$ , which depends on the treatment of the soil on the water bath with a 10%  $\text{NaOH}$  soln. for 90 min., is shown to give too high results since 0.29, 1.40, and 55% of the  $\text{SiO}_2$  of quartz, feldspar and  $\text{Na}_2\text{SiO}_3$ , resp., are thus dissolved. The treatment of 5 g. of soil with 100 cc. of a 1%  $\text{Na}_2\text{CO}_3$  soln. at  $100^\circ$  for 15 min. is recommended. The quantities of amorphous  $\text{SiO}_2$  as detd. by this method are very small. The explanation is that alkali carbonates are formed simultaneously with the  $\text{SiO}_2$  in weathering and act upon it, forming  $\text{K}_2\text{SiO}_3$ , which is quickly removed in soln. The unaltered amorphous  $\text{SiO}_2$  is also sol. in  $\text{H}_2\text{O}$  and is similarly removed.

ALBERT R. MERZ.

The solubility of the soil potash in various salt solutions. D. K. TRESSLER. *Soil Science* 6, 237-57(1918).—The amt. of  $\text{K}_2\text{O}$  that dissolved in salt solns. was detd. in 2 silt loams, 2 sandy loams, a fine sandy loam, a humus loam and a clay subsoil. The method consists in allowing the soil to remain in contact with the various salt solns. until the systems come to equil. The solns. are decanted and filtered through a Pasteur-Chamberland filter, and the  $\text{K}_2\text{O}$  is detd. by a colorimetric method.  $\text{CaSO}_4$  in soln. increases the soly. of  $\text{K}_2\text{O}$  in some soils. It is more marked in clay than in silt or sand. The soil  $\text{K}_2\text{O}$  of Dunkirk silt loam is more sol. in solns. of  $\text{CO}_2$  and  $\text{CaCO}_3$  than in solns. of  $\text{H}_2\text{CO}_3$  containing the same amt. of  $\text{CO}_2$ . Na salts are very active in dissolving soil  $\text{K}_2\text{O}$ .  $\text{NaCl}$  and  $\text{Na}_2\text{CO}_3$  being more active than  $\text{NaNO}_3$ .  $\text{NaCl}$  in concns. of 300 p. p. m. dissolved appreciable amts. of  $\text{K}_2\text{O}$ . With higher concns. the sol.  $\text{K}_2\text{O}$  increased with the concn. of the salt soln. A partial review of the literature is given.

J. J. SKINNER.

Note on the plasticity and the "firmness" of clay. OTTO NOLTE. *Intern. Mitt. Bodenk.* 6, 351(1916); *Biedermanns Zentr.* 47, 108-9(1918).—A heavy clay was thoroughly extd. with ether and acetone. On evapn. a yellow mass remained which consisted of S and an unidentified org. substance. Extn. did not diminish the plasticity of the clay and N was unable to verify Böttcher's (*Über die Verflüssigung des Tones durch Alkali*. Dissertation, Dresden, 1908) conclusion that this property is predominantly influenced by the org. content. Attention is called to the necessity of guarding against error in the detn. of org. matter by combustion, as  $\text{SO}_2$  from S and pyrite will be fixed by  $\text{PbO}_2$  or similar suitable substances.

ALBERT R. MERZ.

The tote moor (dead bog) beside the Steinhuder Sea. JOHN. *Mitteilungen des Vereins zur Förderung der Moorkultur im Deutschen Reiche* 35, 360(1917); *Biedermanns Zentr.* 47, 104(1918).—A review of the study on bogs by Carl Birk. The geographical, geological, meteorological and biological relations of the bog are described and the chemistry and physics as well as the technical utilization thereof are discussed. An insight is given into the chem. behavior of individual kinds of peat at different depths and at different points in the horizontal extension of the peat bed. For details reference must be had to the review.

ALBERT R. MERZ.

The partial sterilization of soils. G. TRUFFAUT. *Compt. rend.* 167, 433-6(1918).—The results of pot and large-scale field expts. by T. confirm the conclusions of Russell ("Soil Conditions and Plant Growth," London (1912 and 1917); cf. *C. A.* 6, 3153) and Midge (*C. A.* 11, 2381). Treatment of the soil with  $\text{CS}_2$  increased the yields of cabbage and onions and the plants were free from diseases and the attacks of insects.  $\text{CaS}$  similarly increased the yields of various plants.  $\text{CaS}$ , containing 10%  $\text{ZnS}$ , gave diminished yields compared with those obtained with pure  $\text{CaS}$ . Naphthalene, anthracene, heavy oils, toluene and benzene increased the yields of cabbage. Their influence on godetias was not so pronounced, crude anthracene, in the amt. used, even acting unfavorably. Mixts. of  $\text{CaS}$  and the above aromatic hydrocarbons were beneficial. The conclusion is drawn that partial sterilization hinders the development

of animal and vegetable parasites in addition to bringing about a better utilization of the soil's reserves by the plant.

ALBERT R. MERZ.

**Azofication.** J. E. GREAVES. *Soil Science* 6, 163-217(1918).—A general discussion of the subject of nitrification and a review of the literature are given. A bibliography of 211 references is appended. It is concluded that the part played by *Azotobacter* in maintaining the N of the soil is an important factor. It is estd. that these organisms under favorable conditions add 15-40 lbs. of available N to each acre of soil yearly.

J. J. SKINNER.

**The importance of mold action in the soil.** S. A. WAKSMAN. *Soil Science* 6, 137-55(1918).—A review of literature and a discussion of the subject. The conclusion is drawn that molds take an active part in the decompn. of carbohydrates in the soil. The molds do not fix any appreciable amt. of atm. N. A list of 62 references is appended.

J. J. SKINNER.

**The influence of the cultivation of an upland bog soil on its microbial activity.** TH. ARND. *Mitteilungen des Vereins zur Förderung der Moorkultur im Deutschen Reiche*. 35, 269(1917); *Biedermanns Zentr.* 47, 105-7(1918); cf. *C. A.* 11, 1708.—All samples taken from uncultivated, raw and strongly acid upland bog soil at depths of 5 to 20 cm. contained microbes capable of ammonifying organically combined N. The putrefactive power of the soil is very small as a result of soil conditions and the consequent small number and effectiveness of the putrefying bacteria. The measures involved in cultivation, especially liming, brought about a very marked increase of ammonifying activity. The ammonifying power of a mineral soil used for comparison exceeded during the first year that of the more strongly limed bog soil. Nitrifying bacteria were not present in the raw, uncultivated bog soil nor during the first year in portions of it limed up to 1500 kg. CaO per hectare. Liming to the extent of 2 tons CaO per acre gave the soil a small nitrifying activity which was much less than that of the check mineral soil. Bacteria are present in the raw acid soil which can reduce nitric and nitrous salts with or without the liberation of N. Cultivation and liming increased the  $\text{NO}_3^-$ -destroying activity in proportion to the amt. CaO added. The denitrifying power of the strongly limed soil soon corresponds with that of a mineral soil of neutral reaction rich in microbes. *Azotobacter* organisms are not present in raw acid upland bog soil nor had they colonized during the first year upon cultivated areas either weakly or strongly limed. *Bac. amylobacter* was found in all samples of uncultivated and cultivated bog soil. Tubercle bacteria were present in only a few samples of raw uncultivated bog soil. No verifiable transfer of tubercle bacteria had taken place during the course of a half year from an inoculated soil to neighboring cultivated bog areas.

ALBERT R. MERZ.

**Are unusual precautions necessary in taking soil samples for ordinary bacteriological tests?** C. B. LIPMAN AND D. E. MARTIN. *Soil Science* 6, 131-6(1918).—Soil samples taken to a depth of 5 ft. with an ordinary soil auger and by the "aseptic" method from a flamed vertical wall of a pit, show no significant dissimilarity in bacterial counts, ammonifying power for peptone, nitrifying power and nitrogen-fixing power. It is concluded that for ordinary bacteriol. work on soils, no special precautions are necessary in taking soil samples. It was observed that in the 2 soils studied large bacterial numbers were found at relatively great depths, both samples being from the arid regions.

J. J. SKINNER.

**Bacterial toxins in soils.** R. GREIG-SMITH. *J. Agr. Victoria* 16, 119-20(1918).—An excerpt from a former paper (cf. Brit. Assoc. Adv. of Science, 1914). Aq. exts. of soils, filtered through porous porcelain and seeded with *B. prodigiosus*, are used to det. the presence of toxins. Attention is called to the fact that it is not always easy to demonstrate the presence of toxins, but some of the conditions under which they are

not to be expected to respond to the test have been fully established by investigations. "For example, they are destroyed by exposing the soil to the sun, by heating the soil, by storing the soil in the air-dry condition; they decay rapidly in aq. soln. and are destroyed upon boiling. They are sol. in  $H_2O$  and are washed out of the soil by rain." Evidence is offered to show that there are at least 2 kinds of toxins in soils: one which predominates in the soil, is thermolabile; the other, in the subsoil, is thermostable.

R. B. DEEMER.

**Report on the examination of commercial cultures of legume-infecting bacteria.** C. R. FELLERS. *Soil Science* 6, 53-67(1918).—Of 32 samples, 2 cultures were classed as poor. The general condition of the cultures examd. was very good. Soy beans were more difficult to inoculate than most of the common legumes. It was found that heat, light and exposure do not affect soil cultures as much as agar or liquid cultures. The plate method of testing pure cultures was used, the results being verified by growing the plants and examg. the roots for nodules.

J. J. SKINNER.

The effect of inoculation, fertilizer treatment and certain minerals on the yield, composition and nodule formation of soy beans. C. R. FELLERS. *Soil Science* 6, 81-119(1918).—Inoculation gave an increase in yield of total dry matter and of seed of soy beans. From vegetation and field tests it was found that some commercial cultures were ineffective while others are as efficient in producing nodules on the host plant as freshly isolated cultures of *B. radiculicola*. The protein content of soy beans was increased and the oil content decreased by inoculation, in direct proportion to thoroughness of infection of the plant. The progress of *B. radiculicola* in soil from area to area is very slow. Liming acid soils in amts. of 1000 to 2000 lbs. per acre increased production of soy beans and stimulated nodule production. The oil content of soy beans decreases and protein increases in direct proportion to the largeness of application of lime. Acid phosphate exerted a beneficial influence on protein formation in seed. On limed soil it caused an increased growth, increased nodule formation and oil content of seed. One hundred to 200 lbs. per acre was as beneficial as larger amts. KCl caused only a small increase of growth and nodule formation and a slight decrease in oil content of seed.  $NaNO_3$  inhibited nodule formation, caused an increase in protein content in seed and a decrease in their oil content.  $MnSO_4$  stimulated germination and early growth of soy beans, but did not stimulate nodule production nor give increased yields; it had practically no effect upon the oil or protein content of the seed. The protein content of soy beans is increased by applications of 100 pounds of S per acre; larger amts. caused decreases. Oil content of seed was increased by S. The field expts. were conducted on Penn. fine sandy loam and on acid Sassafras sandy loam. The pot expts. were on Penn. fine shaly loam, mixed with varying amts. of a coarse quartz sand.

J. J. SKINNER.

**Tests of commercial cultures for legume inoculation.** H. A. NOYES AND C. O. CROMER. *Soil Science* 6, 69-77(1918).—The object of this work was to det. the amt. of inoculated soil to use per acre and to test relative efficiency of soil and commercial cultures, and the effect of fertilizers on inoculation. With sweet clover both soil and commercial cultures, when dild. so that each obtained either its exact proportion of the culture or of the bacteria in the inoculated soil used, gave successful inoculation, soil and culture being equally efficient. With other crops inoculation was not secured under the conditions of the expt. Fertilization with  $NaNO_3$  tended to reduce the percentage of inoculation secured. The investigation comprized pot and greenhouse plot tests.

J. J. SKINNER.

**The description of environment as a basis for the judgment of its influence upon plant growth.** H. VATER. *Intern. Mitt. Bodenk.* 6, 159, 209, 293(1916); *Biedermanns Zentr.* 47, 100-3(1918).—As the result of a study of the literature in which

the observation of plants for ecological study, the food-dissolving secretions of roots and expts. to det. analytically the content of nutritive matter, and the description of environment as a basis for the estn. of its influence on plant growth are critically considered, the conclusion is reached that a thorough description of the influence of soils on plants can only be given by means of a geological basis of classification of the soils. A complete description of environment comprizes the particulars demanded in "Anleitung zur Standorts- und Bestandsbeschreibung beim forstlichen Versuchswesen" (1908), the results of soil investigations as well as, in case the root space lies in the sphere of influence of the ground water or the soil is exposed to regular inundations, the chem. analysis of the waters concerned. The relationship between the growth of plants and the environment can only be learned by investigating thoroughly in a sufficiently large number of places both the environmental conditions and the plant growth. The investigation of such places must include, beside the description of environment, growth expts. for the detn. of the sufficiency of plant foods and these must be carried out on the place itself as pot expts. are insufficient. The extn. of ash constituents and N compds. from the soil by plants is conditioned on (1) the effort of the plant to take up food elements in proportions dependent upon its species, (2) the amt. of available food constituents in the soil, (3) the weather. There is no solvent whose effect upon the soil completely coincides with the solvent power of plants. It is impossible to det. the fertility of a soil even with respect to a single plant species by a comparison of the food constituents of the soil in question with a fixed scale of constituents. The detn. of these constituents is however the starting point of the investigation of the influence of environment on plants. The investigation must be carried out separately for each combination of plant species and soil variety and rests in part directly and in part indirectly upon all characteristics of the environment. A classification of soils cannot be made to meet all requirements and different classifications must be used according to the purpose. In the estimation of plant growth with respect to the plant food content of the soil Liebig's law of minimum must be observed. The plant food content of soils of like variety can be strictly compared only when the food present in least amt. is known and is the same in the soils to be compared. An exhaustive bibliography is given.

ALBERT R. MERZ.

Conversion of quicklime in soil. G. HAGER. *J. Landw.* 65, 245-311(1917); *J. Chem. Soc.* 114, I, 247.—When CaO is added to soil only a small part reappears as CaCO<sub>3</sub>, the remainder being adsorbed by the soil, and no Ca(OH)<sub>2</sub> being recoverable even after very short digestion. The adsorption may be due to surface action or to chemical causes, and is associated with the observed increased adsorptive power of the soil for other bases (K and NH<sub>4</sub>) which results from an application of lime. The adsorptive power of the soil appears to be related to its content of clay and the presence of unsatd. compds. and normally an equil. is soon reached between the adsorptive and absorptive power of the soil CO<sub>2</sub> and the soil compds., resp. With CaCO<sub>3</sub>, the action is slower and months may pass before equil. is reached. The influence of CaO on the physical character of the soil is also discussed.

L. J. GILLESPIE.

The effect of liming on crop yields in cylinder experiments. J. G. LIPMAN AND A. W. BLAIR. *Soil Science* 6, 157-60(1918).—The need of lime is shown in an expt. in which the soil was fertilized for a number of years with acid phosphate, KCl, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> and dried blood, using a rotation of corn, oats, wheat and timothy.

J. J. SKINNER.

The effect of a different ratio of lime and magnesia on plant growth. O. LEMMER-MANN AND A. EINECKE. *Landw. Jahrb.* 50, 617-48(1917); *Biedermanns Zentr.* 47, 111-4(1918).—Pot expts. were conducted with a natural soil containing 0.2739% CaCO<sub>3</sub> and 0.2939% MgCO<sub>3</sub>, sol. in 10% HCl. Pots 1-3 (I) received no further CaO

fertilization (ratio  $\text{CaCO}_3$ : $\text{MgCO}_3$  1:1); pots 4-6 (II) received 60.78 g. limestone giving a ratio  $\text{CaCO}_3$ : $\text{MgO}_2$  of approx. 3:1; pots 7-9 (III) received 31.39 g. limestone and 29.38<sup>g</sup> g. magnesite giving a ratio of  $\text{CaCO}_3$ : $\text{MgCO}_3$  1:1; pots 10-12 (IV) received 8 g.  $\text{CaCO}_3$ , 52.78 g.  $\text{MgCO}_3$ , making the ratio 1:2.3. All pots were also fertilized with 10 g.  $\text{KH}_2\text{PO}_4$ , 6.3 g.  $\text{K}_2\text{SO}_4$  and 10 g.  $\text{KNO}_3$ . Oats were used as the crop and rye grass as a second crop after a supplementary fertilization with 0.66 g. N. The results of the expts. show that the yields of series I and III which contained relatively the same ratio of lime and magnesia but in different absolute amts. are approx. the same. They also show that no particular ratio can be deduced which acts most beneficially on oats and rye grass. The ratio 3:1 which in one year gave the highest yields gave no higher yields than the other series the following year. A second set of expts. was conducted with quartz sand. Ten kg. sand per pot received 1.5 g.  $\text{KH}_2\text{PO}_4$ , 0.7 g.  $\text{K}_2\text{SO}_4$ , 4.0 g.  $\text{NaNO}_3$ , 0.2 g.  $\text{NaCl}$ , and 0.12 g.  $\text{FeCl}_3$ . To these marble dust and magnesite were added to give the following series:

|                       | I.  | II. | III. | IV. | V.  |
|-----------------------|-----|-----|------|-----|-----|
| $\text{CaCO}_3$ ..... | 9   | 7.5 | 5    | 2.5 | 1   |
| $\text{MgCO}_3$ ..... | 1   | 2.5 | 5    | 7.5 | 9   |
| Ratio.....            | 9:1 | 3:1 | 1:1  | 1:3 | 1:9 |

Oats were first raised but were harvested early because of a failure of the crop. Rye grass was raised the next year. The only conclusion to be drawn from the oat expt. is that the high  $\text{MgO}$  had an injurious effect. This was not shown with rye grass. The final conclusions drawn are: It is apparent that there exists an optimal ratio not only of lime and magnesia but between still other food elements. Since we can not yet ascertain these relations and are not in a position to det. the soils' content of assimilable food elements in order to produce a proper ratio of food elements, furthermore do not sufficiently exactly know the relative minimum of the plant food elements for plants, the figures given by Loew can have no general significance. This is confirmed by many expts. Attention is called to the significance of the law of the minimum with respect to the problem.

ALBERT R. MERZ.

**Fertilizers.** A. BAGULEY. *J. Chem. Met. Min. Soc. S. Africa* 18, 301-3 (1918).—A reply to discussion of B.'s paper (*C. A.* 12, 1095). The view is advanced that the effect of free S applied to the soil is due to its effect on microscopic soil flora and fauna, brought about by partial sterilization of the soil.

ALBERT R. MERZ.

**The effect of unbalanced fertilizers, especially unbalanced potash fertilizers.** W. SCHNEIDERWIND. *Illust. landw. Ztg.* 37, 493-4 (1917); *Biedermanns Zentr.* 47, 109-11 (1918).—The results of fertilizer expts. on plots that had previously received no  $\text{P}_2\text{O}_5$  in 14 yrs. show that the influence of  $\text{K}_2\text{O}$  together with N and  $\text{P}_2\text{O}_5$  was greater than that of  $\text{K}_2\text{O}$  with N alone but that  $\text{K}_2\text{O}$  with N increased the yields over those obtained with  $\text{K}_2\text{O}$  only. On plots that had previously received no N for 14 yrs. the effect of a potash-phosphate fertilizer with N was considerably greater than without N. The potash-phosphate fertilizer alone brought about noteworthy increases of yield. The rendering available of the soil-N and the soil- $\text{P}_2\text{O}_5$  by potash salts can take place only in restricted measure and cannot possess practical significance, as is shown by  $\text{P}_2\text{O}_5$  and N detns. in culture plants not fertilized with  $\text{K}_2\text{O}$ . The effect of unbalanced potash fertilizers is therefore solely a  $\text{K}_2\text{O}$  effect. The  $\text{NO}_3$ -forming effect of  $\text{CaO}$  fertilization is not to be over-estd. because most cultivated soils contain the amts. of  $\text{CaO}$  necessary for it. Crops exptd. with were sugar beets., potatoes, wheat and barley.

A. R. M.

**Gravimetric estimation of phosphates.** W. R. MUMMERY. *Analyst* 43, 324 (1918).—The following modification of Ullmann's method has been used successfully for a number of yrs. in the analysis of guano and fertilizers. After digestion, filtration of the  $\text{HNO}_3$  soln. must be made before it is made up to standard vol. Ppt. phospho-

molybdates at 60° and allow to stand for 30 min. at 60°. Ppt.  $\text{MgNH}_4\text{PO}_4$  at 80° and allow to stand for 3 hrs. at room temp.

H. M. LANCASTER.

**The residual effect of superphosphate.** G. S. GORDON. *J. Dept. Agr. Victoria* 10, 610-7(1918).—Data taken from the Victorian Year Book 1913-14, show that in 1898 only 7% of the land under cultivation was fertilized with phosphate; this has increased year by year. In 1913, 77% of the cultivated land was fertilized. In 1913, 219,423 tons of rock phosphate and 105,612 tons of superphosphate were used in Victoria. Expts. at the Werribee Farm show that superphosphate used in amts. of 50 to 200 lb. per acre gave large increase in crop production. The residual effect on the second crop was also very marked.

J. J. SKINNER.

**Injurious effect of borax in fertilizers on corn.** S. D. CONNER. *Proc. Indiana Acad. Sci.* 1917, 195-9.—A com. fertilizer containing 5% of  $\text{K}_2\text{O}$ , 5% of available  $\text{P}_2\text{O}_5$ , and 2.35%  $\text{H}_3\text{BO}_3$  proved harmful to corn in pots when used in amts. of 100 lbs. per acre. Fifty lbs. per acre caused no damage. The damage was caused by preventing germination, by bleaching the leaves of the young corn and by stunting or killing the young plant. An artificial fertilizer made in the lab. so as to contain the same amt. of  $\text{K}_2\text{O}$ ,  $\text{P}_2\text{O}_5$  and  $\text{H}_3\text{BO}_3$  had the same detrimental effect as did the com. fertilizer. Field observations substantiated the results of the pot test. The effect varied somewhat with the character of the soil.

J. J. SKINNER.

**Ten years' cultivation and replanting of varieties of potatoes upon the experimental farm of Pentkowo from 1907 to 1916.** IHLE, DORHLER AND BIELER. *Frühlings Landw. Ztg.* 1917, Nos. 17 and 18, 337 pp.; *Biedermanns Zentr.* 47, 121-5(1918).—To test the widespread opinion that varieties of potatoes degenerate with continued cultivation, 16 varieties were raised and replanted for 10 consecutive years. The soil, fertilizer additions and planting conditions are described. The replanted varieties found satisfactory conditions for growth at Pentkowo and were enabled to furnish as high or higher yields than the "original seed stock" (i. e., potatoes grown from seed obtained elsewhere and not from seed grown on the exptl. field). Comprehensive tables are given comparing for each of the 16 varieties the crop yields of the "original seed stock" and of the "replanted" potatoes during the successive years. Lack of  $\text{K}_2\text{O}$  in fertilizer showed itself quite markedly in comparison with complete fertilizer application. This was much less if at all the case with  $\text{P}_2\text{O}_5$  and even with N. Lack of  $\text{K}_2\text{O}$  fertilization caused not only a diminution of yields but also decreased the deposition of starch in the tubers. Potatoes of the series "without  $\text{P}_2\text{O}_5$ " showed a higher starch content. This was also shown by an additional expt. with 8 varieties raised with and without  $\text{P}_2\text{O}_5$  fertilization, which indicated that  $\text{P}_2\text{O}_5$  cannot increase the starch content of the tuber. The increase of yield per acre was for the av. of the 8 varieties with the "original" as well as with "replanted" potatoes greater upon the  $\text{P}_2\text{O}_5$  plots than upon those "without  $\text{P}_2\text{O}_5$ ." Further expts. are in progress to ascertain the influence of  $\text{P}_2\text{O}_5$  upon protein content. No criteria could be observed from which to draw conclusions upon the differences in behavior of the "original" and "replanted" varieties toward  $\text{P}_2\text{O}_5$ .

ALBERT R. MERZ.

**Powdery mildew of the apple.** W. J. ALLEN AND W. LE GAY BRERETON. *Agr. Gas. N. S. Wales* 29, Pt. 6, 408-12(1918).—A study of the use of FeS, lime-sulfur, Bordeaux mixture, and a proprietary fungicide, called atomic sulfur. Removal of affected wood and terminal eyes accompanied by spraying with FeS was most effective. Details of the time for spraying are given and the method of prepg. the FeS is described.

R. B. DEEMER.

**Copper fungicides for vine diseases.** F. DE CASTELLA. *J. Dept. Agr. Victoria* 16, 592-9(1918).—The chem. of Bordeaux mixt., its physical nature, and its effect on vine diseases are discussed.

J. J. SKINNER.

Composition of the irrigation waters of Utah (GREAVES, HIRST) 14. Production of acid phosphate from creamery waste sulfuric acid (CARR) 12. The peanut (KERLE) 12. Fertilizers from sewage sludge (U. S. pat. 1,284,441-2) 14.

TRUFFANT, G.: Production des legumes. Versailles: by the author.

Fertilizer. G. A. R. BORGHESE, *et al.* Can. 187,572, Nov. 26, 1918. Phosphoric material, potash material and  $\text{NaHSO}_4$  are mixed and heated to fusion, the fused mass is then ground. It is sol. in a 2% citric acid soln.

Fertilizer. G. A. R. BORGHESE and G. STAMPA. Swiss 77,804, June 1, 1918. In the manuf. of a fertilizer containing K phosphate in a form sol. in a 2% citric acid soln., a mixt. of  $\text{Ca}_3(\text{PO}_4)_2$  and Al K silicate is fused in a furnace with a small amt. of a flux such as  $\text{NaHSO}_4$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{CO}_2$ , Cl, F, or a ferruginous or manganiferous compd. as a constituent of one of the minerals employed.

Fertilizer. J. H. CONNOR. U. S. 1,283,677, Nov. 5. A fertilizer is prepd. by mixing blast furnace flue dust containing Fe and K compds. and salt residue and calcining the mixt. to convert the K compds. present into sol. or available state.

Fertilizer. J. H. CONNOR. U. S. 1,283,678, Nov. 5. A fertilizer is produced by boiling a mixt. of bone phosphate of lime, tobacco stems, animal refuse and  $\text{Na}_2\text{CO}_3$  under steam pressure, drawing off the resulting liquor and boiling it down. Slag, flue dust and phosphate rock also may be used.

Fertilizer. A. F. DELACOURT. U. S. 1,282,385, Oct. 22. A fertilizer containing available phosphate and K compds. is produced by heating a mixt. of  $\text{Ca}_3(\text{PO}_4)_2$ , leucite or other K-bearing silicate rock and free  $\text{SiO}_2$ , to a temp. of about 1000-1100°.

Fertilizer. N. A. BARBIERI. U. S. 1,282,170, Oct. 22. See Brit. 110,338 (C. A. 12, 399).

Fertilizer containing available phosphoric anhydride and potash. R. F. GARDINER. U. S. 1,282,805, Oct. 29. A mixt. of  $\text{CaCl}_2$  and minerals such as apatite or orthoclase is heated with sawdust or other wood waste at a bright red heat to obtain a mixed fertilizer.

Rendering phosphates citrate-soluble. E. C. SOPER. U. S. 1,281,681, Oct. 15. Insol. Ca phosphate, to be rendered citrate-sol., is pulverized and mixed with sufficient  $\text{H}_2\text{O}$  (about 40% the wt. of the phosphate) to form a plastic or fluid mixt. To this mixt. there is added an amt. of  $\text{Na}_2\text{CO}_3$  or  $\text{Na}_2\text{SO}_4$  equal to about 15% the wt. of the phosphate. This mixt. is then rapidly heated in thin layers so that the moisture is flashed into vapor and a porous solid residue is obtained which is subjected to a temp. high enough to produce reaction with formation of citrate-sol. phosphate.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT H. WAHL.

Manufacture of spirit from molasses. E. GALLE. *Z. angew. Chem.* 31, I, 3-4, 6-7 (1918).—Fermentation by beer yeast is the only method of obtaining a satisfactory yield of alc. from molasses containing raffinose. Under certain conditions gum-like substances may be formed while the presence of a large amt. of salts or especially of certain salts may cause a bad fermentation; nitrites and fatty acids have a strong restrictive influence.  $(\text{NH}_4)_2\text{PO}_4$  is added in some molasses distilleries to give a more vigorous growth. It is well to apply fermentation tests to the molasses and to store it and use it according to the results of these tests. A convenient test is as follows:

Dil. a quantity of molasses corresponding to 42 g. by polariscopic test with 300 cc. of  $H_2O$ , neutralize with  $N H_2SO_4$ , add 3 cc. additional, and then treat with 30 cc. of a yeast culture which has been fermented down to 7 saccharimeter degrees. Connect the flask with a Hayduck's app. charged with  $H_2SO_4$  and keep at  $30^\circ$ . A good sample of molasses should give 0.5 g.  $CO_2$  after 6 hrs., 1.5 g. after 12 hrs., and at least 4 g. after 18 hrs. From results of these tests and from the alkalinity molasses may be classified into three groups; (1) requiring 4 cc. of  $N$  acid per 100 cc. for neutralization and yielding 4 to 6 g.  $CO_2$  in 18 hours; (2) alkalinity 5 to 8 cc., yielding 3 to 4 g.  $CO_2$ ; (3) alkalinity over 8 cc., yielding less than 3 g.  $CO_2$ . Molasses which has undergone acetic or butyric fermentation is sometimes neutralized with soda or lime, but such products ferment badly. For fermentation of molasses a yeast acclimatized to HF is the most suitable, but attempts to acclimatize beer yeast to HF have been unsuccessful. A good yeast culture is prepd. as follows: Neutralize 10 g. of molasses with  $H_2SO_4$ , dil. to  $38^\circ B$ , boil, cool and after 48 hrs. boil again. Treat 170 cc. of this liquid with 70 cc. of  $(NH_4)_2PO_4$  and 10 cc. of approx. 0.2  $N$  HF and 25 cc. of a resin soap soln., made by boiling 100 kg. of resin with 20 g. KOH in 500 l. of water, and dilg. the soln. to  $4^\circ B$ . Make up this liquid to one liter in a fermentation flask and treat with 60 cc. of pure yeast culture, keeping the flask at  $19^\circ$  and drawing a slow current of sterilized air through the liquid. After 24 hrs. the liquid will have fermented down to 7 saccharimeter degrees and more cultivations can be made from it until an amt. is obtained large enough to use  $\frac{3}{4}$  of it for pitching the molasses. The yeast cultivation from one ton being introduced into the second and so on, it is possible to ferment good molasses down to  $6^\circ$  in 12 to 14 hours, but it is necessary to keep the temp. from rising above  $30$  to  $32.5^\circ$ .

J. K. DALE.

**Determination of glycerol in wines.** MAURICIO CANÓNICA. *Anales soc. quim. Argentina* 6, 94-101 (1918).—C. proposed the following modified Laborde-Pasteur procedure in the case of wines containing less than 5% sugar: Fifty cc. of wine, after addition of approx. 100 g. of No. 4 Pb shot and 10 drops concd.  $H_2SO_4$  are concd. on a sand bath to approx. 3 cc.; after cooling there are gradually added to this 2-3 g. (an amt. approx. equal to that of the ext.) of finely powdered  $Ca(OH)_2$ . The mass is agitated with the shot and the final consistency should be neither too stiff nor too fluid; more  $Ca(OH)_2$  should be added if necessary. After several mins. the glycerol is extd. with 75 cc. of a mixt. of 1 vol. 95% alc. and  $1\frac{1}{4}$  vol.  $Et_2O$ , care being taken to keep the mass in suspension in the liquid in the form of a thin paste. The liquid is decanted, the residue is extd. with 40 cc. of the  $Et_2O$ - $EtOH$  mixt., the liquid is again decanted and the residue is finally washed with 30 cc. of  $Et_2O$ - $EtOH$ . In the case of wines containing 5-20% of sugar the procedure is the same as before with the exception that the original liquid is not concd. to quite such an extent; the  $Ca(OH)_2$  must be added very gradually with const. agitation and the mass should be moistened with 50% alc. if it is too stiff in consistency. The same proportion of  $Ca(OH)_2$  is used as before and extn. with  $Et_2O$ - $EtOH$  is the same. In the case of wines containing more than 20% sugar extn. is more difficult. Fifty cc. of wine are concd. as before (after addition of Pb shot and  $H_2SO_4$ ) to a sirupy consistency (approx. 50% of ext.). After coolin  $Ca(OH)_2$  is very gradually added in the same proportion as before (i. e., in amt. approx. equal to the amt. of ext. in the original 50 cc. of wine) with const. agitation, 50% alc. being used to moisten the mass so as to form a thin paste. The latter is treated with 120 cc. of 80% alc. (added gradually with agitation) and the whole is then heated to approx.  $75^\circ$ . After cooling the liquid is decanted on a filter and the residue of Ca saccharate is carefully washed 2-3 times with hot 80%  $EtOH$ , the total amt. of  $EtOH$  employed being approx. 250 cc. After adding 10 cc. of  $H_2SO_4$  the alc. ext. is evapd. to several cc.; approx. 2 g.  $Ca(OH)_2$  are added and the resulting paste is extd. with  $Et_2O$ - $EtOH$  as in the preceding cases. The  $Et_2O$ - $EtOH$  soln. obtained in the



preceding cases is concd. by evapn. and, when a sirupy consistency is obtained, the residue is heated  $1\frac{1}{2}$  hr. (approx. the time required for drying glycerol containing 15% of  $H_2O$ ) at  $70^\circ$ , cooled and weighed. The weighed residue is dissolved in  $H_2O$  and the soln. is evapd. to dryness at  $180^\circ$  (sand bath), the wt. of the residue being subtracted from the original wt. and the difference reported as glycerol. The procedure suggested by Laborde (carbonizing the glycerol with concd.  $H_2SO_4$  at  $150^\circ$  and washing and weighing the resultant C) is not recommended because (among other reasons) of the organic impurities which accompany the glycerol; in addition it is difficult to avoid reduction of  $H_2SO_4$  by the C. C. gives results of analyses in which the preceding methods were tested by detg. glycerol before and after addition of glycerol to vermouth and wines of various types. The methods were also tested by detg. glycerol before and after addition of large proportions of sugar to wines and comparison was also made with the official German method for detn. of glycerol in wines. Satisfactory results were obtained, considering the errors naturally inherent in such methods.

H. S. PAINE.

**Utilization of Argentina raw materials.** JUAN B. TERÁN AND JOSÉ LUCAS PENNA. *Univ. Tucumán inform. depart. investig. industr.* 1917, 21-5.—T. and P. discuss a plan developed by the Univ. of Tucuman for the study from a technical standpoint of means of utilizing the resources of Argentina in various raw materials. The systematic utilization of corn and potatoes for manuf. of alcohol is recommended and the possibility of using alc. denatured with  $C_6H_6$  as a source of power for automotive vehicles to replace gasoline is discussed from a technical standpoint.

H. S. PAINE.

**Alcohol.** KELLOG TOASTED CORN FLAKE CO. Can. 185,862, July 30, 1918. Roasted or burnt starch is washed to dissolve out the sol. ingredients, the insol. ingredients are converted into maltose and dextrins, the latter are inverted into fermentable sugars, the liquor is fermented and alc. is sepd. out.

**Alcohol.** THE ACME LABORATORIES. Can. 185,743, July 30, 1918. Lactic fermentation of whey renders the unfermented lactose therein susceptible to alc. fermentation. The lactose soln. is then treated with sucrose in a state of fermentation to decompose the lactose with the sucrose.

**Alcohol.** B. KAZMANN. Brit. 119,333, Nov. 15, 1917. Alc. is prepared from burnt or roasted cereals or starchy materials such as result from fires in grain elevators, etc., or are formed as residues in processes for making coffee substitutes by extg. with  $H_2O$  roasted legumes, nuts, tubers such as taro or arrowroot, starch-bearing roots, fruits such as figs, prunes, or bananas, seeds such as cottonseed or St. John's bread, Algaroba beans, soy beans, or grains such as yeast, rye, barley, corn, Kaffir corn, or rice. The material after being washed or heated to expel substances which retard fermentation, is treated with a diastatic material such as malt, *Aspergillus oryzae*, etc., the mash or the liquid ext. is heated with  $H_2SO_4$  to convert the dextrin into fermentable sugar, and the liquid is cooled, fermented, and distd. Cf. C. A. 12, 1812.

**Caramel for coloring liquors.** A. DANIEL. Swiss 77,801, June 1, 1918. In the manuf. of caramel, which is readily sol. in  $H_2O$  and alc., and which colors rum, cognac, and liquors without turbidity, carbohydrates are heated with HOAc with the addition of dehydrating agents. The caramel is pptd. from the soln. by  $Na_2CO_3$  or NaOH.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

An institute for coöperative research as an aid to the American drug industry. *J. Ind. Eng. Chem.* 10, 969-76(1918).—This is a report of a symposium before the

New York Section of the Am. Chem. Soc. in which are reproduced the following addresses: "A national institute for drug research," by JOHN J. ABEL. An institute of chemotherapy, by P. A. LÉVENE. Drug research and the Bureau of chemistry, by C. L. ALSBERG (in abstract form). An institute for research in synthetic organic chemistry, by A. S. LOEVENHART. An institute of therapo-chemical research, by FRANK R. ELDRED. Institute for research on synthetic drugs, by D. W. JAYNE. Remarks concerning suggestion for central medicinal research laboratory, by E. R. WEIDLEIN. E. J. C.

Conditions essential for the commercial manufacture of carvacrol. A. W. HIXSON AND R. H. MCKEE. *J. Ind. Eng. Chem.* 10, 982-92(1918).—The essential results of the investigation are summarized as follows: The process for producing carvacrol from cymene as derived from spruce turpentine has recourse to the following necessary operations: (1) Making cymenesulfonic acid by thoroughly agitating the turpentine with an equal vol. of 66° Bé.  $\text{H}_2\text{SO}_4$  at a temp. of 90-100° for 4 hrs. in a cast-iron sulfonating kettle. (2) Neutralization of the excess  $\text{H}_2\text{SO}_4$ , formation of Ca cymenesulfonate in soln. by adding ground  $\text{CaCO}_3$  to the sulfonation products and removal by filtration of the  $\text{CaSO}_4$  formed. (3) Formation of Na cymenesulfonate by adding soda ash to the hot filtrate and removal by filtration of the pptd.  $\text{CaCO}_3$ . (4) Conc. of the Na cymenesulfonate soln. in a vacuum evaporator to the point of satn. (5) Pptn. and drying of the Na cymenesulfonate by means of a rotary steam-heated film dryer, or other suitable method. (6) Fusion of the dry Na cymenesulfonate with approx. one-half its wt. of 76% NaOH in a cast-iron or steel fusion kettle provided with a cover and condenser at a temp. of 350-70° for 6 hrs. (7) Pouring the fused product into a minimum amt. of cold  $\text{H}_2\text{O}$ , and subsequent neutralization with just enough 40° Bé.  $\text{H}_2\text{SO}_4$  to fix the excess NaOH and to set free the carvacrol from its Na salt. (8) Separation of the carvacrol by steam distn. or by agitation with a solvent, as benzene. (9) Recovery of solvent by distn. (10) Distn. of the carvacrol from the benzene ext. with a direct by heated still. (11) Fractionation of the carvacrol from the same still. This process was tested on a large scale and found to give better results than when tested in a small way. W. O. E.

Constituents of oil of cassia. F. D. DODGE. *J. Ind. Eng. Chem.* 10, 1005-6 (1918).—In addition to previously known constituents of this oil, D. has identified benzaldehyde and methyl salicylaldehyde in 2 samples recently examd. W. O. E.

Ephedrine and pseudoephedrine. E. SCHMIDT. *Mon. sci.* 8, 151-9, 197-206 (1918).—A bibliography and résumé of work accomplished in this field, especially by S. and his co-workers. W. O. E.

The evaluation of balsam of Tolu. T. T. COCKING AND J. D. KETTLE. *Am. J. Pharm.* 90, 719-22(1918); cf. *C. A.* 8, 3346; 12, 2229.—It is pointed out that the method of the Brit. Pharm. 1914, for the estn. of the balsamic acids in balsam of Tolu is unsatisfactory. The results obtained are low, as much of the aromatic acid present is combined with resin alcs. and is insol. in, and thus not extd. by,  $\text{CS}_2$ . Boiling out of the aromatic acids with MgO and  $\text{H}_2\text{O}$ , in the presence of a small quantity of xylene to soften the resinous matter, was found to be the most satisfactory way of dealing with the balsam. The Mg salts of the aromatic acids are readily sol. in cold water, those of the resin acids being insol. A complete sepn. is effected and the aromatic acids are obtained in a purer condition than by aq. extn. alone. The procedure is as follows: (1) *Free balsamic acids*: Dissolve 5 g. of the balsam in 25 cc. hot alc. in a 250-cc.  $\text{CO}_2$  flask, add 5 g. of light MgO and 20 cc. xylene and shake the flask round until the contents are well mixed. Add 100 cc.  $\text{H}_2\text{O}$ , connect the flask to a reflux condenser and boil for 1 hr. After cooling, pour the whole on a Büchner filter, and sep. the aq. portion of the filtrate from the xylene layer, which is returned to the

flask together with the filter paper and adhering magnesia-balsam magma. Add a second 100 cc. of water and again boil for 1 hr. Then sep. the aq. portion of the filtrate as before and carry out the extn. a third time. Wash the bulked aq. liquids once with 20 cc.  $\text{Et}_2\text{O}$ , then render acid with  $\text{HCl}$  and ext. the pptd. acids by shaking out with  $\text{Et}_2\text{O}$ . Dist. off the greater part of the  $\text{Et}_2\text{O}$ , dry the residual aromatic acids *in vacuo* over  $\text{H}_2\text{SO}_4$  and weigh. (2) *Total balsamic acids*: Saponify 2.5 g. of the balsam by boiling with excess of alc.  $\text{KOH}$ ; then evap. off most of the alc., dissolve the residue in 100 cc. hot  $\text{H}_2\text{O}$ , and add sufficient  $\text{HCl}$  to render the whole slightly acid. Next add 5 g. of light  $\text{MgO}$  and 20 cc. of xylene and boil the whole under a reflux condenser for 1 hr. Sep. the aq. liquid repeat the extn. twice, and treat the bulked aq. liquid as in the case of the free balsamic acids. For detn. of cinnamic acid in the mixt. use the bromination method (De Jong, C. A. 4, 559). W. G. GAESSLER.

*Essential oil of artemisia annua* L., especially the portion which boils at high temperature. S. TAKAGI. *Yakugaku Zasshi* (J. pharm. soc. Japan) No. 439, 665-76(1918).—The raw material used in the expt. is a light reddish yellow transparent viscous oil. From 500 g. oil, 52 g. colorless oil  $b_p$ , 125-130° and 98 g. light yellow oil  $b_p$ , 130-170°, were obtained by fractional distn. The first fraction purified by distg. over  $\text{Na}$  and  $\text{K}$ , consists chiefly of a portion  $b_p$ , 122-3°,  $d_{14}$  0.89416,  $n_D^{14}$  1.50435,  $[\alpha]_D^{13}$  -87.65°. Analysis gives the formula  $\text{C}_{14}\text{H}_{24}$ . By passing dry  $\text{HCl}$ ,  $\text{HBr}$  and  $\text{HI}$  into the oil, cadinene hydrohalides, and by hydration with Bertram and Wahlbamm's method, isocaryophenylhydrate m. 96° were obtained. A sesquiterpene alc. of the formula  $\text{C}_{14}\text{H}_{22}\text{OH}$  or  $\text{C}_{14}\text{H}_{20}\text{OH}$ ,  $b_{14}$ , 168-171°, was sep'd. from the second fraction by fractional distn. It has the following physical properties:  $d_{11}$  0.9497,  $n_D^{21}$  1.50882,  $[\alpha]_D^{21}$  +12.41°. It is sol. in  $\text{EtOH}$  and forms an Ac compd. on heating with  $\text{Ac}_2\text{O}$  and  $\text{AcONa}$ . S. KOMATSU.

Some observations on the solution of zinc chloride and several suggested solvents J. C. AND B. L. DE G. PEACOCK. *J. Am. Pharm. Assoc.* 7, 689-97(1918).—Several  $\text{Zn}$  salts are employed in therapy, chiefly as lotions, injections, mouth washes and eye washes. The solns. are usually in  $\text{H}_2\text{O}$  and contain but a few grains of the  $\text{Zn}$  salt per fl. oz.  $\text{ZnCl}_2$  frequently does not dissolve well owing to the formation of  $\text{Zn}(\text{OH})\text{Cl}$ . This forms a bulky ppt. which renders the prepn. unsightly. If the soln. be filtered the correct amt. of  $\text{Zn}$  salt is not present. The addition of  $\text{HCl}$  causes complete soln. but this is frequently not permissible. Hot  $\text{H}_2\text{O}$  does not solve the difficulty. Complete soln. may be obtained by the addition of  $\text{H}_3\text{BO}_3$  or of  $\text{NH}_4\text{Cl}$ . In therapy one or the other of these may usually be allowable. The presence of  $\text{NaCl}$ , as in physiologic salt soln., does not interfere. Also in *Am. J. Pharm.* 90, 706-17(1918).

L. E. WARREN.

The manufacture of aspirin tablets. R. C. WHITE. *J. Am. Pharm. Assoc.* 7, 697-700(1918).—A discussion.

L. E. WARREN.

The effect of alcohol on the activity of liquor hypophysis. P. S. PITTINGER. *J. Am. Pharm. Assoc.* 7, 831-2(1918).—It has been asserted that the presence of small amts. of  $\text{EtOH}$  destroys the physiol. activity of the soln. From the results of a series of expts. P. concludes that the belief is unfounded.

L. E. WARREN.

Brazilian jalap and some allied drugs. O. A. FARWELL. *J. Am. Pharm. Assoc.* 7, 852-5(1918).—Botanical and pharmacognostical descriptions of the market supplies of *Piptostegia pisonis*, *Resina drastica* and *Ipomoea orizabensis*. F. believes that the plant from which Brazilian jalap is derived should be named *Operculina macrocarpa* L. *Resina drastica* is from an undetd. botanical source, but its characteristics indicate that it is derived from some member of the *Convolvulaceae*. The resin from Brazilian jalap is yellow; that from *Resina drastica* is black.

L. E. WARREN.

**Piptostegia root, *Piptostegia pisonis* Mart.**, so-called "Brazilian jalap." C. O. EWING AND J. F. CLEVELAND. *J. Am. Pharm. Assoc.* 7, 855-8(1918).—A root offered for importation as "jalap" was not the true drug but the root of *Piptostegia pisonis* Mart. The spurious drug assayed 23% of resin by the U. S. P. method for jalap. The resin was of a light tan color and conformed to the U. S. P. tests for jalap resin except for a slight excess in acidity and the formation of a greenish color with 10%  $\text{NH}_4\text{OH}$   $\alpha_D$   $-48.5^\circ$ . Specimens of the resin were extd. with various solvents. Pet. ether dissolved 2.1%,  $\text{Et}_2\text{O}$  5.4%,  $\text{CHCl}_3$  73.4%,  $\text{EtOAc}$  14.2%, and  $\text{EtOH}$  4.7%. A comparison of these solubilities with the records for the resins of scammony, jalap, Mexican scammony and morning glory shows that this resin differs markedly from them all, the most striking difference being in its much greater soly. in  $\text{CHCl}_3$ . Only about 25% of the true resin of jalap is sol. in  $\text{CHCl}_3$ . Large doses of the resin produced emesis without catharsis in dogs. Smaller doses produced catharsis without emesis.  
L. E. WARREN.

High-melting-point fatty acids and other products from wool-fat or similar substances (U. S. pat. 1,284,723) 27.

MAY, PERCY: **The Chemistry of Synthetic Drugs.** 2nd Ed. Revized and enlarged. London: Longmans, Green & Co. 250 pp. 10s. 6d.

**Oxycholesterol.** I. LIFSCHÜTZ. U. S. 1,284,724, Nov. 12. Oxycholesterol is made by dissolving cholesterol in  $\text{CHCl}_3$  or  $\text{CCl}_4$  and treating the soln. with a mild oxidizing agent such as benzoyl peroxide and heating to the b. p. for 2-10 hrs.

**Guaiacol.** E. H. ZOLLINGER. U. S. 1,281,662, Oct. 15. In the manuf. of guaiacol, 11 g. of pyrocatechol is intimately grated with 25 g. of  $\text{KCH}_3\text{SO}_4$  and mixed with 15 g. of veratrol. To this mixt., 25 g. of  $\text{NaHCO}_3$  is added in portions during 2 hrs. at a temp. of  $160-180^\circ$ . Upon cooling, the reaction product is acidified and subjected to steam distn. A yield of 10.5 g. of guaiacol may be recovered from the distillate.

**Dry non-hygroscopic lime product.** J. A. WÜLFING. Holl. 2,432, Apr. 15, 1918. A mixt. of Na and Ca lactate, in the proportion of 2 to 1, is incorporated with the lime in granular form, the mass being then dried.

**Therapeutically active derivatives of *p*-aminophenol.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 78,043-5, July 1, 1918. Addition to 76,619, (C. A. 12, 2411). Derivs. of *p*-aminophenol are obtained by treating *p*-aminophenyl allyl ether with formylating agents, or by heating it with a compd. containing the lactic acid radical, or by treating it with a compd. containing the radical of isovaleric acid, or by treating it with *o*-bromoisovaleryl halides. The properties of the products are specified.

**Product for coagulating blood.** SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 77,601, June 1, 1918. In the prepn. of a coagulant for blood from beer yeast, the latter is boiled with alc., whereby the coagulation of the yeast albumin and other chem. changes are effected. After the addition of  $\text{H}_2\text{O}$ , the alc. is expelled by distn. *in vacuo*, and the resulting emulsion is shaken with ether, acetone is added, the resulting ppt. is filtered off and again extd. with ether, and the ethereal soln. is evapd. to dryness *in vacuo* with pulverized sugar. Cf. C. A. 12, 2111.

**Inulin for therapeutic use.** A. DANIEL. Swiss 77,857, June 1, 1918. In a process of obtaining inulin from plants, in a form suitable for therapeutic use, the albuminous and deleterious substances are sepd. by the addition of strongly alk. substances and with heating. The solns. must be kept strongly alk.

**Iron-albumin compound.** K. KOTTMANN. Swiss 78,276, July 1, 1918. Albumin from altered animal cell material is treated with substances containing Fe, obtaining an Fe-albumin compd., a well defined substance with the Fe in intimate combination. The product has diagnostic and therapeutic value.

**Alkaloids.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 119,287, Sept. 27, 1917. A water-sol. prepn. of the active constituents of ergot suitable for injection is obtained by extg. the drug (previously powdered and freed from oil) first with H<sub>2</sub>O and then with dil. alc. containing a small proportion of a volatile organic acid (H.COOH, HOAc, etc.); the alc. ext. is distd. *in vacuo*, with addition of H<sub>2</sub>O, to remove alc. and excess organic acid; it is then filtered and mixed with the aq. ext. The mixed soln., with or without further purification, is evapd. to dryness, or is concd. and brought to a definite vol.

**Camphor.** DU PONT DE NEMOURS & Co. Brit. 118,489, Sept. 28, 1917. Crude camphor is purified by heating in a closed retort to 300–500° F., whereby the camphor oil is modified so that it can be sepd. from the camphor, either by dissolving out the camphor with an organic solvent (petroleum spirit, alc., etc.) and crystallizing, or by subliming the camphor.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**Women in the chemical industries of England.** J. Ind. Eng. Chem. 10, 1028–9 (1918).—A list is given of processes in which women are successfully employed. Issued by the Brit. Ministry of Munitions. E. J. C.

**The foreman in chemical industry.** ALBERT HUTIN. Rev. prod. chim. 21, 287–8 (1918). E. H.

**A manufacturer's experience with graduate chemical engineers.** S. R. CHURCH. J. Ind. Eng. Chem. 10, 1019–20 (1918). E. J. C.

**The interconnection of economic botany and chemical industry.** EDWARD WHEELER. J. Soc. Chem. Ind. 37, 307–10 (1918). E. H.

**Chemical manufacture in India.** ANON. Chem. Trade J. 63, 252 (1918).

E. H.

**The chemical markets of Colombia, Ecuador, The Guianas, Venezuela, and Paraguay.** O. P. HOPKINS. J. Ind. Eng. Chem. 10, 977–81 (1918). E. J. C.

**Great industrial laboratories.** Andre Citroën laboratories. ANON. l'Ind. chimique 5, 242–4 (1918). E. H.

**New after-war preparations in the chemical industry of Germany.** The agreement between the dyestuff trust and the cartel of explosives. Reduction of the tax on war profits in favor of products manufactured for export. The need for an interallied technical organization. P. PRUIT. Chimie et industrie 1, 136–8 (1918); J. Ind. Eng. Chem. 10, 1025–6 (1918). E. J. C.

**German chemical industry in war-time and after.** ANON. Chem. Trade J. 63, 379–80 (1918). E. H.

**Gas warfare, both offensive and defensive.** H. W. DUDLEY. Chem. Met. Eng. 19, 705–9 (1918).—An address before the N. Y. Section of the Soc. Chem. Ind., Oct. 25, 1918. E. H.

**Barytes and barium products in 1917.** JAMES M. HILL. U. S. Geol. Survey, Mineral Resources of U. S., 1917, Pt. II, 285–91 (preprint No. 21, published Oct. 14, 1918); cf. C. A. 12, 83. E. H.

**Fluorspar and cryolite in 1917.** ERNEST F. BURCHARD. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Pt. II, 293-304 (preprint No. 22, published Nov. 20, 1918); cf. C. A. 12, 405. E. J. C.

**Fuller's earth in 1917.** JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Pt. II, 253-55 (preprint No. 19, published Sept. 18, 1918). E. H.

**Monazite.** SYDNEY J. JOHNSTONE. *J. Soc. Chem. Ind.* 37, 373-6R(1918).—A review. E. H.

JAEGER, F. M.: *De Stikstof-Nood en de Middelen tot Zija Bes rijding.* 2nd Ed. Groningen Den Haag: Gebroeders Hoitsema. 40 pp.

**Sulfuric acid.** H. V. WELCH. U. S. 1,284,166, Nov. 5. Oxides of N and fumes of  $H_2SO_4$  and nitrosylsulfuric acid are removed from the effluent of the chamber process of making  $H_2SO_4$  by passing the effluent between electrodes between which a high tension elec. field is maintained to effect pptn. upon the electrodes. The pat. describes and illustrates app. for carrying out the procedure. U. S. 1,284,167 describes the manuf. of  $H_2SO_4$  by the contact process. The  $SO_3$  is brought into contact with a spray of dil.  $H_2SO_4$  and the  $H_2SO_4$  mixt. thus formed is pptd. electrically.

**Sulfuric acid.** L. BRADLEY. U. S. 1,284,175, Nov. 5. Dust is electrically pptd. from a gas stream containing  $SO_2$  and  $H_2SO_4$  (such as may be produced by burning pyrites) while a temp. is maintained sufficiently high to avoid substantial deposition of  $H_2SO_4$  and thereafter the gas is cooled to form a cloud or mist containing  $H_2SO_4$  and subjected to a second elec. pptn. to obtain  $H_2SO_4$ . U. S. 1,284,176 specifies electrically pptg. dust from burner gases while maintaining a sufficiently high temp. to avoid substantial deposition of  $H_2SO_4$ , then partially oxidizing the  $SO_2$  in the gases, cooling and subjecting to a second elec. pptn. to recover  $H_2SO_4$ .

**Crystallized phosphoric acid.** J. N. CAROTHERS and W. H. ROSS. U. S. 1,283,398, Oct. 29. ("Dedicated to the public" for free use without payment of royalty.) Phosphorus oxide fumes from any smelting operation are collected electrically in an app. of such radiating surface that the fumes will be pptd. at a temp. above  $100^\circ$  and the collected acid is then allowed to cool to a temp. below its m. p. A solid product is thus obtained.

**Concentrating nitric acid.** B. THOMAS. U. S. 1,283,598, Nov. 5. Concd.  $HNO_3$  is obtained by absorbing nitrogenous gases such as those generated from air in an elec. furnace in a liquid such as  $H_2O$  under pressure and at the same time converting the lower oxides of N into  $HNO_3$  by electrolysis, at a temp. below  $40^\circ$ .

**Sodium cyanide.** H. P. EASTMAN. U. S. 1,282,395, Oct. 22. NaCN is made by melting a mass of NaCl, adding "lime nitrogen" and  $CaC_2$  and maintaining the temp. above  $900^\circ$  (preferably over  $1100^\circ$ ) until reaction is complete.

**Sodium cyanide.** H. FREEMAN. U. S. 1,282,405, Oct. 22. In the production of NaCN by fusing a mixt. containing NaCl and "lime nitrogen," the fused product, as it runs from the furnace, is rapidly cooled to such a temp. as to avoid decompn. of the NaCN produced. The product may be obtained in the form of flakes containing NaCN,  $CaCl_2$ , NaCl and free lime.

**Ammonium perchlorate.** E. A. LESUEUR. U. S. 1,284,380, Nov. 12.  $NH_4ClO_4$  is formed by heating an aq. soln. of  $(NH_4)_2SO_4$  and  $NaClO_4$  to a temp. slightly above that at which substantial sepn. of hydrated  $Na_2SO_4$  occurs, as a result of which copious formation of  $NH_4ClO_4$  takes place, sepg. the liquid from the crystals, dilg. the liquid and chilling it to effect crystn. of hydrated  $Na_2SO_4$ , leaving  $NH_4ClO_4$  in soln.

**Sodium and aluminium hypochlorites.** E. E. DURR and P. C. DURR. Brit. 119,261, Aug. 22, 1917. In a process of mfg. Na and Al hypochlorites, Na aluminate is first produced by heating a mixt. of calcined bauxite, NaCl,  $\text{Ca(OH)}_2$ , and C to redness in a retort in a current of  $\text{As}_2\text{O}_3$  vapor.  $\text{AsCl}_3$ , H, and  $\text{CaCO}_3$  also are formed, the  $\text{AsCl}_3$  being condensed and employed for the manuf. of Cl for use later in the process. The residue is lixiviated and the soln. of Na aluminate is divided into 2 parts into one of which  $\text{CO}_2$  is passed until the pptn. of  $\text{Al(OH)}_3$  is complete. The  $\text{Na}_2\text{CO}_3$  is filtered off and employed for the production of NaOH for subsequent use in the process. The ppt. of  $\text{Al(OH)}_3$  is mixed with the remainder of the Na aluminate and Cl is passed into the mixt. till all the Al has passed into soln. as hypochlorite. The HCl formed is neutralized with NaOH soln. which is added in sufficient quantity to ppt. Al as hydroxide with production of NaOCl. The  $\text{Al(OH)}_3$  is filtered off, mixed with  $\text{H}_2\text{O}$  and converted into hypochlorite by passing Cl into the liquid. The NaCl produced is crystd. out from the solns. of the hypochlorites.

**Alkali dichromates.** SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES. Brit. 119,219, Jan. 25, 1918. Alkali dichromates are obtained by treating monochromates with  $\text{CO}_2$  in the presence of  $\text{H}_2\text{O}$  with or without an org. solvent of the dichromate such as EtOH, MeOH or acetone. The alkali bicarbonate is sepd. by means of its slight soly. in solns. of dichromate, particularly in the presence of the above mentioned org. solvents.

**Potassium chloride.** E. A. ASHCROFT. Brit. 119,492, Aug. 28, 1917. KCl is obtained from potash-bearing minerals such as feldspar, mica, alunite, or leucite, or from cement-kiln dust, blast-furnace dust, wood or plant ashes, beet-sugar residues, etc., by treating the substances with Cl gas while suspended in a fused bath of Na or K chloride, or a mixt. A Cl carrier such as a salt of Fe, Mn, or Cr, and a reducing agent such as C or Na, K, Zn, Pb, or Fe sulfide may be added. The reaction is carried out in a converter at about  $800\text{--}1100^\circ$  and may be continued until some constituents, which form volatile chlorides such as Fe or Al, are sepd. by volatilization. KCl is sepd. by lixiviation.

**Anhydrous calcium chloride.** E. A. ASHCROFT and B. T. PLUMLEY. Swiss 78,103, June 17, 1918. Cl is allowed to act upon a Ca compd. in a molten bath, in the presence of C and of a Cl carrier serving as a catalytic agent. The principal reaction is illustrated by the equation  $2\text{CaO} + \text{C} + 2\text{Cl}_2 = 2\text{CaCl}_2 + \text{CO}_2$ . A secondary reaction is  $2\text{FeS}_2 + 3\text{Cl}_2 = \text{Fe}_2\text{Cl}_6 + 4\text{S}$ . The catalytic reaction proceeds in two phases:  $\text{Fe}_2\text{Cl}_6 + 3\text{CaO} = 3\text{CaCl}_2 + \text{Fe}_2\text{O}_3$  and  $2\text{Fe}_2\text{O}_3 + 6\text{Cl}_2 + 3\text{C} = 2\text{Fe}_2\text{Cl}_6 + 3\text{CO}_2$ .

**Potassium salts from kelp.** S. R. OPPENHEIM. U. S. 1,283,547, Nov. 5. K salts obtained from kelp or similar materials and containing org. substances are freed from the latter by filtering a soln. of the impure salts through bone char.

**Soluble potassium compounds from siliceous minerals.** J. H. STOVER. U. S. 1,283,951, Nov. 5. Orthoclase or a similar K-bearing mineral is finely pulverized, mixed with an alkali metal carbonate, hydroxide or oxide and fused at a red heat. About 1.5 times as much  $\text{K}_2\text{CO}_3$  as orthoclase may be employed, and, if desired, powdered coal or other combustible may be added to assist the fusion. If the rock is powdered to 200 mesh, the reaction may be effected at a sintering temp. Any alkali which is volatilized is condensed in the stack and recovered. The reaction mass is run into  $\text{H}_2\text{O}$  and may be agitated with steam or compressed air to dissolve the  $\text{K}_2\text{CO}_3$ , KOH and K silicate, leaving in suspension a finely divided silicate of K and Al which may be decomposed by acid. For the latter purpose, chamber  $\text{H}_2\text{SO}_4$  is suitable if but small amts. of alk. earth metals are present in the residue, but if larger amts.

of alk. earth metals are present HCl is preferably used to avoid formation of insol. salts. The silicic acid obtained in the last mentioned step is filtered out and may be treated with NaOH to form Na silicate. As an alternative procedure, alumina can be pptd. by use of KOH and can be filtered out with silica. The alumina can be then dissolved with an acid and, after filtering, the silica will remain in such form that it will readily form waterglass on boiling with an alkali.

**Phosphorus or its compounds from mineral phosphate.** W. H. WAGGAMAN, C. R. WAGNER and H. BRYAN. U. S. 1,282,994, Oct. 29. A charge of phosphate, siliceous material and coke is fed down through a vertical shaft constituting the inner chamber of a furnace, upon a table where it is heated by means of burning fuel which may either be mixed with the charge or may be otherwise supplied. The products of combustion and the volatilized products are then led out through a chamber surrounding the inner or charging shaft and the P and phosphoric acid are recovered in any desired manner. An app. is described for carrying out the operation. Oil, coal or gas may be used as the fuel.

**Recovering phosphorus fumes from phosphate rock.** A. R. MERZ, W. H. ROSS and J. N. CAROTHERS. U. S. 1,284,200, Nov. 5. The P evolved from phosphate rock by the volatilization method is recovered by introducing into the fumes of the P oxides a substance (such as  $\text{NH}_3$ , steam or KCl) which will react with the fumes, and the resulting compd. is collected on a filter.

**Utilizing niter cake.** J. GROSSMANN. Brit. 119,290, Sept. 28, 1917. The reaction between finely powdered niter cake and  $\text{NaNO}_3$  or  $\text{NaCl}$  to produce  $\text{HNO}_3$  or HCl is effected in the presence of coal, coke, or other carbonaceous matter in fairly large pieces (about half an in. in diam. or more) in order that the resultant salt-cake shall be friable and easily removable, while the reducing action of the coke etc. is small. The reaction is carried out as described in 111,875 (C. A. 12, 855) and 114,180 (C. A. 12, 1501). In making HCl, the temp. may be raised in the later stages to 350-450°.

**Separating alumina and silica.** C. M. HALL. U. S. 1,282,222, Oct. 22. Aluminous materials of high  $\text{SiO}_2$  content, such as clays or low-grade bauxites are mixed with NaCl in the proportion of about 4 mols. NaCl to each mol. of  $\text{Al}_2\text{O}_3$  present and the mixt. is passed through a furnace wherein it is exposed to steam. HCl is evolved and the solid compn. containing Na aluminosilicate is mixed with lime and soda and this mixt. is heated to about 700-760° for 2-3 hrs. to produce sol. Na aluminate and insol. Ca silicate, which may then be sepd. by leaching.

**Agglomerate.** G. FREY. Swiss 78,065, June 17, 1918. Solid particles are imbedded in a slurry of MgO,  $\text{MgCl}_2$ ,  $\text{MgSO}_4$  and  $\text{Al}_2(\text{SO}_4)_3$ . E. g., a mixt. of sawdust and MgO is agglomerated by means of a soln. of  $\text{MgCl}_2$  of 32° Bé a soln. of  $\text{MgSO}_4$  of 30° Bé and a soln. of  $\text{Al}_2(\text{SO}_4)_3$  of 28° Bé.

**Nitric oxide from internal-combustion engines.** R. DRAWE. U. S. 1,283,112, Oct. 29. In operating internal-combustion engines to produce nitric oxide, highly heated steam, air or other gas is injected into the fuel mixt. to increase the heat of the latter in proportion to its vol., the high temp. of the mixt. is maintained up to the end of the compression stroke, to effect formation of nitric oxide, combustion being completed when the highest temp. is reached. The rapid fall of temp. thereafter minimizes decompn. of the nitric oxide formed.

**Nitrogen and carbon dioxide.** C. D. McCOURT. Can. 187,662, Nov. 26, 1918. Accelerated surface combustion of an explosive gaseous mixt. of fuel and air is effected, the  $\text{CO}_2$  is absorbed from the combustion gases by contact with carbonate liquor and the N is sepd. from the decarbonated combustion gases. The  $\text{CO}_2$  is removed from the carbonated liquor by heat and the liquor is returned to absorb more  $\text{CO}_2$ .



**Recovering values from alunite.** R. MOLDENKE. U. S. 1,282,273, Oct. 22. Alunite is digested with concd.  $\text{H}_2\text{SO}_4$  in a closed chamber under ordinary pressure and at a temp. of about  $260\text{--}315^\circ$  to effect free evolution of vapors, the mixt. of acid and converted material is withdrawn from the chamber, the solid material is sepd. by settling and dissolved, sulfate is crystd. from the soln. and the crystd. product is calcined in an atm. of  $\text{SO}_2$  and O to produce  $\text{H}_2\text{SO}_4$  and alumina.

**Separating solids from liquids.** P. T. SHARPLES. Brit. 119,288, Sept. 27, 1917. A compn. having constituents of different sp. gr. is mixed with a carrier liquid heavier than at least one of the said constituents and subjected to centrifugal action to sep. the constituents. In a particular example, the lighter constituent is first sepd. from the remainder of the mixt., which may be further subjected to centrifugal action to sep. the carrier liquid, which is heavier than either constituent from the heavier constituent. The carrier liquid may be returned to the app. and used repeatedly.

**Dehydrating emulsions.** F. W. HARRIS. U. S. 1,281,952, Oct. 15. In dehydrating emulsions such as those of  $\text{H}_2\text{O}$  and petroleum oil, electrodes within the emulsion are caused to approach each other sufficiently to cause  $\text{H}_2\text{O}$  chains to be formed between the electrodes through which heavy short-circuit currents can flow. The electrodes are then sepd. and the current interrupted.

**Manufacturing gasblack, hydrogen, etc.** C. D. MCCOURT. Can. 187,661, Nov. 26, 1918. Methane is forced through a highly heated porous and permeable bed of refractory material where it is decompd. into gasblack and H. These are sepd. The temp. of the bed is maintained by burning the H thus produced.

**Metal-polishing powder free from acid.** E. BEUTEL. Swiss 77,897, June 1, 1918.  $(\text{NH}_4)_2\text{CO}_3$  is added to the metal polish. E. g., 100 parts powdered clay are mixed with 30 parts wood dust and 10 parts  $(\text{NH}_4)_2\text{CO}_3$ , and packed in gas-tight paper.

**Solution of low freezing point.** C. A. LEWIS. U. S. 1,282,249, Oct. 22. A soln. of low freezing point, adapted for use in automobile radiator systems is formed of  $\text{CaCl}_2$  40,  $\text{H}_2\text{O}$  58 and a soln. of glucose, borax and caramel 2%.

**Phenolic condensation products.** T. A. EDISON. U. S. 1,283,706, Nov. 5. *p*-Phenylenediamine in the proportion of 0.5–1.0% is added to the usual ingredients for producing hardened phenolic condensation products upon heating, for the purpose of accelerating the speed of the final hardening reaction.

**Laminated articles containing phenolic condensation product.** L. T. FREDERICK. U. S. 1,284,296, Nov. 12. Solid articles (such as elec. insulation) are formed by building up a rectangular article of laminations of paper and phenolic condensation product which has not been transformed into final insol. form and then applying heat and pressure to the sides and edges of the article to mold and harden it.

**Tubes or rods of sheet material and phenolic condensation product.** L. T. FREDERICK. U. S. 1,284,297, Nov. 12. Tubes or rods adapted for use as elec. insulation are formed by winding a sheet of paper, cloth or similar sheet material, associated with a phenolic condensation product, placing the roll in a heated mold and applying pressure axially to harden and compact it.

**Tubes of fibrous material and phenolic condensation product.** L. T. FREDERICK. U. S. 1,284,298, Nov. 12. Tubes adapted for use as elec. insulation are formed by treating paper with a phenolic condensation product which will serve as a binder, winding the dry sheet around a mandrel without applying heat or pressure to build up a tubular body and then applying heat and pressure so as first to soften and then to harden the phenolic condensation product.

**Electrical insulating material from fibrous sheets and phenolic condensation products.** L. T. FREDERICK. U. S. 1,284,644, Nov. 12. A decorative insulating material is formed by building up a laminated body of differently colored sheets of paper or other fibrous material and phenolic condensation product, shaping the laminated material and, while clamped in the desired shape, subjecting it to the action of heat and pressure simultaneously.

**Laminated articles from fibrous sheet material and phenolic condensation product.** D. J. O'CONOR, JR. U. S. 1,284,432, Nov. 12. Sheets of paper, muslin, or other fibrous material are treated with a phenolic condensation product which is capable of being solidified by the action of heat and pressure, the treated sheets are superposed upon each other, subjected to heat and pressure and during the last stage of this treatment the heat is increased and the pressure is lowered. This produces a product which is adapted for use as an elec. insulating material.

**Tubes of fibrous material and phenolic condensation product.** W. H. KEMPTON. U. S. 1,284,363, Nov. 12. Tubes suitable for use as elec. insulation are formed by winding upon a mandrel a sheet of paper or other fibrous sheet material treated with a phenolic condensation product, and then applying pressure to the entire inner surface of the tube and heating it while under pressure.

**Electrical insulating material.** L. T. FREDERICK. U. S. 1,284,295, Nov. 12. Composite tubes for use as an elec. insulating material are formed of wound sheet material such as paper treated with a phenolic condensation product. The outer turns are treated with shellac varnish to give the tubes greater strength than they would otherwise have. The assembled sheet material, after being wound upon a mandrel, is heated to at least 90°.

**Compositions for printers' rollers.** J. L. BASSECHES. U. S. 1,284,172, Nov. 5. The object of the invention is the production of printers' rollers which may be recast and which may be made without glycerol or with a smaller amt. of glycerol than usually employed previously. Mixts. of this character are made of glue, H<sub>2</sub>O and beet molasses (or a sirup containing only small amts. of monosaccharides) with or without glycerol, resins, varnishes or oils. Suitable mixts. may, *e. g.*, be formed of glue 30%, beet molasses 35%, glycerol 20% and H<sub>2</sub>O 15%; or from glue 30%, beet molasses 50%, H<sub>2</sub>O 15% and resin oil varnish 5%. Worn out rollers of these compns. may be cut into small pieces, remelted, mixed with about 15% of new material and recast. The beet molasses used is refined by successive treatment with dil. H<sub>2</sub>SO<sub>4</sub> and with powdered CaCO<sub>3</sub>.

**Waterproof cement.** H. M. OLSON. U. S. 1,283,546, Nov. 5. About 1% of animal, vegetable or mineral oil, tallow, wax or similar dry oleaginous material, in anhydrous condition, is ground with dry cementitious material such as a lime or gypsum plaster to prep. a waterproof cement.

**Sound-record.** J. W. AYLSWORTH. U. S. 1,283,450, Nov. 5. Sound-records are formed with a hard surface material capable of softening slightly when heated, *e. g.*, a phenolic condensation product, a backing of material more plastic when heated than the surface material and a sheet of fabric between the surface and backing materials. The backing may be formed of wood flour 50-100 and fusible phenolic condensation product or shellac or rosin 50-100 parts.

**Gramophone records.** C. C. H. MILLAR. Brit. 119,477, Jan. 3, 1916. Disk records are formed of finely ground wood, not in the form of pulp, with or without the addition of flock or shoddy and binding material such as shellac. The dry material is submitted to a jiggling operation to produce a level surface, is damped by H<sub>2</sub>O or steam, and is then slightly compressed to form a disk. The disk may then be

dried and subjected to higher pressure in an hydraulic press. Coloring matter may be added.

**Lubricant.** CHEM. FABRIKEN WORMS AKT.-GES. Swiss 78,279; July 1, 1918. An aq. soln. of a lactate is incorporated with graphite. E. g., 100 parts of an aq. soln. of Na lactate of sp. gr. 1.35 are worked up in a ball mill with graphite to a uniform paste of the desired consistence. The product as thus obtained is ready for use and is permanent.

**Decolorizing material.** R. M. CATLIN. Can. 186,173, Aug. 20, 1918. Decolorizing material is produced by subjecting the residues from slate distn. to the action of HF.

**Calcining granular material.** C. D. McCOURT. Can. 187,659, Nov. 26, 1918. Granular material is continuously fed through a furnace chamber, an explosive gaseous mixt. having combined with it a reagent capable of combining with the charge is injected at a speed greater than that of backfiring and accelerated surface combustion is effected within the charge to heat it and effect chemical changes. The hot combustion gases are passed through the material being fed into the furnace.

**Vegetable glue.** R. W. TUNNELL. U. S. 1,284,495, Nov. 12. An adhesive suitable for uses generally to which vegetable adhesives are adapted is formed of low-grade tapioca 80, high-grade tapioca 20 and  $ZnCl_2$  or other Zn salt 0.1-0.25 part. Cf. C. A. 12, 1693, 2116.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

The second annual report of the delegacy for glass research, University of Sheffield. ANON. *J. Soc. Glass Tech.* 2, 155-70(1918).—In the glass expt. work pots of 28, 56 and 100-200 lbs. capacity are used. Much testing and exptg. for glass mfrs. has been done. General descriptions are given of the courses at Univ. of Sheffield and of the research problems, completed, under way and contemplated. C. H. KERR.

The effect of continued action on chemical glassware of water, acid and alkali. J. D. CAUWOOD AND W. E. S. TURNER. *J. Soc. Glass Tech.* 2, 235-9(1918).—The short-time soly. tests were repeated many times (10 to 25) on representative Zn-Al borosilicate, Al borosilicate, and Na-Ca chem. glasses. **Conclusions:** The Na-Ca glasses obtain a somewhat more resistant surface by continued treatment with either  $H_2O$  or HCl. The borosilicate glasses improve slightly in resistance to  $H_2O$ , but are unchanged in resistance to continued action by HCl. None of the glasses improves in resistance upon continued treatment with either caustic or carbonated alkali. The irregularities found show the folly of drawing conclusions from one or two tests. These variations are thought to be due chiefly to actual lack of homogeneity in the glass and not to exptl. errors. C. H. KERR.

The resistant properties of some types of foreign chemical glassware. J. D. CAUWOOD AND W. E. S. TURNER. *J. Soc. Glass Tech.* 2, 219-35(1918).—Tests previously made (cf. C. A. 12, 212-13) are continued with 11 additional samples, of which 1 is Japanese (K), 5 American (L, M, N, O, T) and 5 German (P, Q, R, S, U). The samples are as follows: K = Japanese; L = Nonsol; M = Insolo; N = Fry; O = Pyrex; P = Resistance "R;" Q = Kohn-Ehrenfeld; R = Kavalier; S = German, unmarked; T = Insol; U = Zsolua. The 6 tests previously described were applied, with results shown in the table below, in which the former glasses are also included.

| Class.      | Boiling H <sub>2</sub> O. | H <sub>2</sub> O at 183°. | 2N NaOH.  | N/10 NaOH. | 2N Na <sub>2</sub> CO <sub>3</sub> . | Boiling HCl. |
|-------------|---------------------------|---------------------------|-----------|------------|--------------------------------------|--------------|
|             | S (0.5)                   | O (15.4)                  | G (235.8) | Q (41.0)   | D (74.1)                             | S (0.7)      |
|             | .....                     | F (29.2)*                 | P (237.3) | G (46.0)   | Q (75.9)                             | O (1.5)      |
|             | A                         | E (32.4)                  | .....     | T (46.5)   | .....                                | R (2.0)      |
|             | G (0.8)                   | B (34.8)                  | T         | F (52.4)   | E                                    | P (2.8)      |
|             | C                         | G (35.0)                  | D (239.4) | L (53.0)   | P (78.0)                             | M (3.0)      |
|             | O                         | C (38.6)                  | .....     | D (53.9)   | .....                                | L (3.1)      |
|             | .....                     | A (39.8)                  | Q (242.9) | N (56.3)   | C (83.2)                             | N (3.2)      |
| Good.....   | L                         | D (41.0)                  | S (273.6) | B (60.0)   | F (83.4)                             | T (3.4)      |
|             | F (0.9)                   | L (60.6)                  | B (276.5) | E (61.8)   | L (87.7)                             | Q (4.3)      |
|             | .....                     | N (75.5)                  | N (280.9) | C (62.1)   | B (90.3)                             | G (5.1)      |
|             | E (1.0)                   | Q (78.6)                  | E (283.8) | M (64.2)   | A (92.2)                             | J (5.4)      |
|             | N (1.1)                   | P (85.9)                  | L (287.1) | A (64.4)   | T (96.8)                             | I (5.8)      |
|             | .....                     | .....                     | R (289.1) | P (65.4)   | .....                                | D (7.2)      |
|             | P                         | .....                     | K (290.0) | .....      | .....                                | H (8.0)      |
|             | B (1.2)                   | .....                     | C (292.4) | .....      | .....                                | E (8.3)      |
|             | M                         | .....                     | M (294.0) | .....      | .....                                | C (9.7)      |
|             | .....                     | .....                     | F (312.5) | .....      | .....                                | .....        |
|             | Q                         | .....                     | .....     | .....      | .....                                | .....        |
|             | D (1.4)                   | .....                     | .....     | .....      | .....                                | .....        |
|             | T                         | .....                     | .....     | .....      | .....                                | .....        |
|             | I (2.8)                   | T (124.8)                 | I (343.4) | R (84.4)   | G (108.1)                            | B (12.5)     |
| Moderate... | R (3.7)                   | M (204.8)                 | O (355.2) | I (90.6)   | N                                    | .....        |
|             | U                         | .....                     | J (364.0) | O (92.2)   | .....                                | .....        |
|             | .....                     | .....                     | A (387.6) | S (98.3)   | M (145.4)                            | .....        |
|             | .....                     | .....                     | .....     | .....      | O (153.3)                            | .....        |
|             | K (5.5)                   | R (994.6)                 | H (470.3) | J (111.3)  | I (263.3)                            | F (18.0)     |
| Bad.....    | J (6.2)                   | I (1435.0)                | .....     | H (136.8)  | J (364.3)                            | A (31.8)     |
|             | H (14.4)                  | J (1924.4)                | .....     | .....      | S (397.0)                            | .....        |
|             | .....                     | H (3470.0)                | .....     | .....      | R (422.5)                            | .....        |
|             | .....                     | S (4917.3)                | .....     | .....      | H (600.7)                            | .....        |

The table shows only 6 glasses (C, D, E, L, P, Q) in the "Good" class in every test. Of these 3 (C, D, E) are British, 1 (L) is American and 2 (P, Q) are German. The comps. of the new glasses are shown below.

|                                      | K.    | L.    | M.    | N.    | O.    | P.    | Q.    | R.    | S.    | T.    | U.    |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| SiO <sub>2</sub> .....               | 74.32 | 68.03 | 69.84 | 68.58 | 80.62 | 66.62 | 66.80 | 75.90 | 76.10 | 67.42 | 76.20 |
| As <sub>2</sub> O <sub>3</sub> ..... | nil   | nil   | nil   | 0.18  | 0.66  | nil   | 2.05  | trace | nil   | nil   | nil   |
| Sb <sub>2</sub> O <sub>3</sub> ..... | nil   | 0.45  | 1.00  | nil   | nil   | 1.80  | 1.29  | nil   | nil   | 0.65  | 0.30  |
| Al <sub>2</sub> O <sub>3</sub> ..... | 2.35  | 2.62  | 0.96  | 2.90  | 2.00  | 3.11  | 2.54  | 0.24  | 0.20  | 0.65  | 0.30  |
| ZnO.....                             | nil   | 7.39  | 3.80  | 3.60  | nil   | 8.20  | 9.75  | nil   | nil   | 8.12  | nil   |
| CaO.....                             | 3.67  | 0.80  | 1.69  | 2.65  | 0.22  | 0.20  | 1.73  | 8.73  | 6.30  | 3.14  | 8.97  |
| MgO.....                             | 0.11  | 3.41  | 6.25  | 2.53  | 0.29  | 3.29  | 2.60  | 0.15  | 0.29  | 4.50  | trace |
| K <sub>2</sub> O.....                | 1.38  | 0.30  | 0.70  | 1.29  | 0.61  | 1.40  | 1.75  | 7.84  | 5.60  | 3.06  | 7.62  |
| Na <sub>2</sub> O.....               | 17.56 | 11.18 | 11.25 | 10.01 | 3.83  | 11.76 | 7.40  | 7.29  | 11.16 | 9.92  | 7.07  |
| B <sub>2</sub> O <sub>3</sub> .....  | nil   | 5.81  | 4.02  | 8.0   | 11.90 | 3.74  | 4.13  | nil   | nil   | 2.35  | nil   |
| MnO.....                             | 0.10  | trace | trace | trace | trace | 0.13  | trace | trace | 0.10  | trace | trace |
| Fe <sub>2</sub> O <sub>3</sub> ..... | 0.14  | 0.20  | 0.34  | 0.20  | 0.16  | 0.14  | 0.17  | 0.10  | 0.14  | 0.21  | 0.14  |

*General conclusions:* (1) Chem. glass makers at present rely mainly on Zn-Al borosilicates or Al borosilicates, the former being usually the better. (2) The resistance of Ca-Na glasses is as follows: toward H<sub>2</sub>O and dil. caustic alkali, fair; strong caustic alkali, good; Na<sub>2</sub>CO<sub>3</sub>, poor; acid, excellent. The Na-Ca glasses are therefore of special

value for analytical work, like  $\text{SiO}_2$  in steel where  $\text{HCl}$  is used. (3)  $\text{SiO}_2$  gives resistance to  $\text{H}_2\text{O}$  and acid, but not to caustic or carbonated alkali. (4)  $\text{B}_2\text{O}_3$  increases resistance to  $\text{H}_2\text{O}$  up to a mol. ratio of about 12 per 100  $\text{SiO}_2$ .  $\text{B}_2\text{O}_3$  lowers resistance to alkali and  $\text{HCl}$ . (5)  $\text{CaO}$  is not, in general, an important ingredient and should be avoided when  $\text{Na}_2\text{CO}_3$  will be used in the vessel. (6) Large amts. of alkali are to be avoided because they decrease resistance to  $\text{H}_2\text{O}$ , acid and alkali. (7)  $\text{Al}_2\text{O}_3$  seems to be a valuable all-round constituent. (8)  $\text{ZnO}$  is in high favor but specific proofs of its great value are not yet found. The  $\text{ZnO}$  glasses are very good in general results. (9) There is no proof as yet of the value of  $\text{MgO}$ . Chem. glassware should be selected with its particular use in mind.

C. H. KERR.

**Compression strength of glass and quartz.** G. BERNDT. *J. Ind. Eng. Chem.* 10, 942(1918).—A borosilicate glass showed 15,200 kg./sq. cm. when in strained condition and 16,900 kg./sq. cm. when well annealed. Quartz showed 25,000 to 27,000 kg./sq. cm. when tested at right angles to the optical axis but much less parallel to the axis.

C. H. KERR.

**Notes on the formation of certain rock-forming minerals in and about glass furnaces.** G. V. WILSON. *J. Soc. Glass Tech.* 2, 177-216(1918).—Most of the samples examd. were taken from a tank which burst and from which 70 tons of metal drained out. Other samples were glass-house pots, bricks and blocks. Very complete descriptions are given of the various minerals and their modes of formation. Optical data are particularly complete. The author's conclusions from his examn. are "(1) Under certain conditions, wollastonite, augite, tridymite, and quartz can all crystallize out from the same melt. (2) Feldspar, magnetic oxide, and biotite are formed by the corrosive action of hot molten glass on common brick. (3) Wollastonite, melilite, an artificial compd. with the formula  $3\text{CaO} \cdot 2\text{SiO}_2$ , and augite are produced in limestone fragments enclosed in molten glass by contact alteration assisted by the absorption of a certain amt. of soda and silica from the glass. (4) Several types of cryst. material were produced, varying from dark bottle glass containing a few isolated wollastonite spherulites to a rock-like substance made up essentially of slender crystals of wollastonite up to 1 inch in length. (5) Absence of pseudowollastonite shows that the temp. of the molten glass when crystallization started cannot have been above  $1190^\circ$  (the inversion temp. of pseudowollastonite to wollastonite). (6) Absence of cristobalite indicated that the temp. was at no time so high as  $1450^\circ$  (the inversion temp. of cristobalite to tridymite). (7) The presence of an amethyst-colored glass rich in Mn shows the general idea held by glass manufacturers, that Mn sinks to the bottom of the tank, to be correct. (8) The presence of quartz crystals in some of this amethyst material leads to the conclusion that the latter remained fluid to a temp. below  $870^\circ$  (the inversion temp. of tridymite to quartz). (9) The absence of quartz in the main body of the glass shows that it had solidified about  $870^\circ$  or become too viscous to allow of crystallization. (10) From (8) and (9) it follows that the amethyst material remained fluid longer than the ordinary green material. This is also proved by the fact that it occurs as a thin strip at the junction of the ordinary material with brickwork, as if the latter had cooled and contracted away and permitted the former to run in to fill up the space." From the investigation of block, pot and brick samples he concludes "(1) Corundum and sillimanite are the minerals usually formed, together occasionally with feldspar, magnetite, and biotite. (2) Corundum is abundant in the fused, glassy surfaces of bricks used in the crowns of furnaces. (3) The white, porcelain-like layers of pots and bricks is often packed with minute needles of sillimanite. (4) The formation of corundum and sillimanite is beneficial, especially so when sillimanite is formed in the inner, vitrified surfaces of glass pots, and also of tank blocks. The network of sillimanite needles acts as a protective coating between the ordinary clay body of the pot or tank

and the contained molten glass. (5) Sillimanite is only developed in pots which vitrified, and the pots which have lasted longest usually contain the greatest development of sillimanite. Burnt aluminous clays generally contain sillimanite, siliceous clays practically never. (6) Since sillimanite seems to be beneficial, it appears that to aid its formation the clays used for the manufacture of pots and furnace blocks should be as aluminous as possible, but should also be capable of vitrification at the temp. to which they are subjected in the furnace." C. H. KERR.

Some additional notes on pot failure. S. N. JENKINSON AND PERCIVAL MARSON. *J. Soc. Glass Tech.* 2, 175-6(1918).—A common cause of cracks across the bottom is insufficient preliminary burning in the pot arch. A down-draft pot arch and a uniform high temp. burning will correct most of the troubles. The practice of placing bricks under one edge is bad because it distorts the bottom. C. H. KERR.

Note on the firing of glass pots. MORRIS W. TRAVERS. *J. Soc. Glass Tech.* 2, 170-4(1918).—In burning, a pot passes through 3 stages: (1) removing "absorbed" and combined  $H_2O$ , (2) biscuit stage, (3) vitrified stage. In stage (2) the pot is very easily attacked and dissolved by molten glass. Changing from (2) to (3) increases d. from about 1.7 or 1.8 to 2.2 or 2.3, and forms a surface layer of sillimanite. The formation of sillimanite is the effect and not the cause of changes which render the pot material insol. Pots should be fired to complete vitrification before glazing or filling. The temp. required will vary with the material, but usually 3 days at  $1350^\circ$  is sufficient. Care must be taken to keep pots hot at the time of filling. C. H. KERR.

Note on the sintering of magnesia. JOHN B. FERGUSON. *J. Am. Ceram. Soc.* 1, 439-40(1918).—Before the war tubes, etc., of  $MgO$  were imported from Germany. Examn. shows these wares to contain about 2% forsterite ( $2 MgO/SiO_2$ ) and about 1% of other impurities which act as bond. At the Geophysical Lab. a special elec. resistance furnace, of the cascade type, used for some hrs. at  $1600$  to  $1720^\circ$  showed sintering of the silky, calcined pure  $MgO$  used to insulate the 2 heaters. Such sintering was not previously observed when the furnaces were operated at temps. below  $1600^\circ$ . The sintered cake showed, under the microscope, no binding material, only periclase (cryst.  $MgO$ ) with less than  $1\frac{1}{2}\%$  forsterite.  $SiO_2$  content found, on analysis, was 0.44%. The mass showed good strength and it seems feasible to make  $MgO$  ware without binder if the product is fired to  $1600$ - $1700^\circ$  for some hrs. C. H. KERR.

The porosity and volume changes of clay fire brick at furnace temperatures. GEORGE A. LOOMIS. *J. Am. Ceram. Soc.* 1, 384-404(1918); cf. *C. A.* 12, 751.—"Changes in porosity may be said to bear some relation" to deformation under load. The present tests were made in coöperation with the Refractories Manufacturers' Association, and the American Gas Institute. Bricks which resist a load test of 40 lbs. per sq. in. at  $1350^\circ$  show only slight vol. or porosity changes when burned at temps. up to  $1425^\circ$ , while most bricks failing in this load test show rather marked vol. or porosity changes below  $1425^\circ$ . Bricks showing pronounced expansion below  $1400^\circ$ , thus indicating over-burning, invariably fail in the load test. Vol. and porosity changes between  $1350$  and  $1425^\circ$  show, "in a measure" the ability to pass load test. Most bricks showing a porosity decrease of not over 5% and vol. change of not over 3% (about 1% linear) when burned at  $1400^\circ$  will pass the load test, while those with greater changes fail. No definite relation was found between softening point and load-carrying capacity. However, all bricks which softened below cone 28 failed in load test. C. H. KERR.

The calculation of the "rational analysis" of clays HENRY S. WASHINGTON. *J. Am. Ceram. Soc.* 1, 405-21(1918).—Only 4 minerals, kaolin, quartz, feldspar, and mica, need be considered. The rational analysis aims at the detn. of the amts. of these minerals, by treating the clay with various strong reagents. Factors of great importance

which are ignored in rational analysis are (1) kind of feldspar, of kaolin or clay, of mica, etc., (2) size of grain, (3) concn. of reagent, (4) time of digesting, (5) temp. conditions, etc. The results can be nothing more than "approximate and uncertain." The making of the usual ultimate analysis and the calcn. of "norm" compn. is only a little more work and is much more reliable. The method of calculating "norms" or mineral compn. from ultimate analysis is repeated in detail.

C. H. KERR.

The action of acetic acid solutions of different strengths on a sheet steel enamel. LEON J. FROST. *J. Am. Ceram. Soc.* 1, 422-8(1918).—Expts. were made to show whether a 20%  $\text{CH}_3\text{COOH}$  soln. exerts the greatest corrosive action on the vitreous enamel used on kitchen utensils. The test dishes were coated with (1) a coat of ground, (2) a thin coat of white enamel, and (3) a good coating of the glaze tested, the formula for which was 0.885  $\text{Na}_2\text{O}$ , 0.085  $\text{K}_2\text{O}$ , 0.015  $\text{CaO}$ , 0.015  $\text{MnO}$ , 0.263  $\text{Al}_2\text{O}_3$ , 2.291  $\text{SiO}_2$ , 0.452  $\text{B}_2\text{O}_3$ , 0.701  $\text{Fe}_2\text{O}_3$ . The enamel frit was milled with 8% Vallender clay and 1%  $\text{MgSO}_4$ . In each test 25 cc. of the test soln. was evaporated to dryness on a const. hot plate. When dry the dish was removed, cooled, washed, scoured with a soft abrasive, rinsed, dried and weighed. The % of acid and corresponding mg. loss in wt. follow: 1%, 0.0056; 2%, 0.0108; 3%, 0.0127; 4%, 0.0140; 5%, 0.0111; 7%, 0.0088; 9%, 0.0127; 15%, 0.0131; 17%, 0.0140; 18%, 0.0151; 20%, 0.0160; 21%, 0.0214; 24%, 0.0223; 27%, 0.0184; 30%, 0.0132; 40%, 0.0179; 50%, 0.0168; 60%, 0.0117; 70%, 0.0076; 80%, 0.0026; 90%, 0.0013; 100%, 0.0003. From 20 to 25% is most corrosive.

C. H. KERR.

Note on the colors produced by the use of soluble metallic salts. PAUL G. LARKIN. *J. Am. Ceram. Soc.* 1, 429-38(1918).—For years sol. metallic salts have been used in under-glaze color work but their use in over-glaze color especially for terra cotta is recent. Details of manipulation are given, also formulas for green, blue, brown, gray, yellow and orange colors. The method is cheap, satisfactory in quality of work produced, and with proper manipulation gives clean edges. The addition of a Pb frit or flux to a standard-finish engobe properly corrected for the addition, greatly improves the colors produced by sol. salts on standard-finish ware.

C. H. KERR.

Glass. CORNING GLASS WORKS. Brit. 118,397, Apr. 15, 1918. In the manuf. of a glass capable of absorbing ultraviolet rays and as nearly colorless as possible,  $\text{TiO}_2$  and an oxidizing salt are added to the glass compn. The Ti compd. may be used in conjunction with  $\text{CeO}_2$  etc., and  $\text{HNO}_3$  is added to prevent reduction of the oxides.

Glass. CORNING GLASS WORKS. Brit. 118,398, Apr. 15, 1918. In the manuf. of glass capable of absorbing ultraviolet rays and as nearly colorless as possible, V is used, preferably in an oxidized form. The V compd. may be used in conjunction with Ti or Ce compds.,  $\text{MnO}_2$ , etc. Niter may be added to prevent reduction of the oxides.

Silica bricks. SOC. ANON. DES PRODUITS REFRACTAIRES DE L'OUEST. Brit. 118,116, Aug. 6, 1918. Silica bricks are made from any quartz or quartzite contg. an av. of 95%  $\text{SiO}_2$ . After disintegrating or after cooling, the material is subjected to a first crushing and part then reduced to a fine flour by a further crushing. Suitable proportions of the two crushings are mixed together with a binder such as  $\text{CaO}$ , molded, and burned.

Decorating glass surfaces. K. WARGA. U. S. 1,283,606, Nov. 5. In fixing designs upon glass, glass colors are mixed with a soft flux to make the coloring matter fusible at a temp. lower than that required to soften the glass to be coated, the desired design is printed upon decalcomania paper in a fixing agent composed of turpentine oil 108, balsam of fir 50, Pb acetate 3 and soft flux 1 part, heated to produce a sirupy

mixt., the colors are applied to this fixing agent on the decalcomania paper, the glass is coated with a fixing mixt. containing the same ingredients but heated just sufficiently to dissolve the Pb acetate in the mixt., colors are transferred from the design on the decalcomania paper to the fixing agent on the glass and the latter is then heated gradually to a temp. at which fusion of the colors occurs, followed by gradual cooling to near atm. temp.

**Heat-insulating composition.** F. A. HEADSON. U. S. 1,283,754, Nov. 5. Heat-insulating material suitable for furnace walls is prepd. by calcining finely divided diatomaceous earth and finely divided asbestos in the proportions of about 75 to 25 parts, resp., mixing these materials with a binder such as  $H_2O$  and clay and molding the plastic product thus formed and allowing it to harden. The product may finally be burned at a temp. above  $1100^\circ$ .

**Brick-baking process.** THE LAMBERT PROCESS CO. Can. 185,692, July 23, 1918. Bricks are piled in a kiln, part of them are fired for a time with carbonaceous fuel and air is blown into the kiln to burn the remaining bricks.

**Refractory substances.** H. E. MASON and A. COUPER. Brit. 119,101, Sept. 27, 1917. In the manuf. of refractory magnesite bricks, a salt or salts of boric acid and (or) perboric acid in conjunction with one or more of the following fluxing agents: basic slag, Fe oxide, Fe ore, metallic Fe or Fe slag, is incorporated with a mixt. of calcined or raw magnesite and  $H_2O$ . The mixt. is formed into bricks and fired. Alternatively the fluxing agent or agents and borate, etc., are mixed, shaped into bricks, calcined, and ground into powder before being mixed with the calcined magnesite. The av. proportions in 100 parts of mixt. are about 1 part of borate, etc., to about 6 parts of each or any or all of the fluxing agents named.

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## 20. CEMENT AND OTHER BUILDING MATERIALS.

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C. N. WILEY.

**The corrosion of iron and steel, with special reference to reinforced concrete.** J. NEWTON FRIEND. *Surveyor* 53, 464-5 (1918).—Curves are given to show the relative corrosion of iron in different solutions. Preservation of iron in concrete may be effected, (1) by complete exclusion of air, (2) by complete exclusion of water, (3) by rendering the concrete sufficiently alk. to place it within the inhibiting area shown in one of the diagrams. W. D. C.

**Stone in 1916.** G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of the U. S.*, 1916, Pt. II, 993-1078 (preprint No. 36, published Nov. 25, 1918). E. J. C.

**Hydraulic cement.** A. S. DWIGHT and R. L. LLOYD. U. S. 1,283,483, Nov. 5. Finely powdered fuel is thoroughly and intimately intermixed with finely divided raw cement material and this mixt. is deposited in a thin layer pervious to air and covered with a thin layer of slowly burning fuel. This covering of fuel is ignited and air is passed through the entire body of materials to cause combustion of the fuel and sintering of the cement-forming materials.

**Calcium oxychloride cement.** C. CATLETT. U. S. 1,282,188, Oct. 22. A compn. suitable for use as an addition to portland cement to increase its plasticity is formed by effecting reaction between com.  $CaO$  and com.  $CaCl_2$  in the presence of sufficient  $H_2O$  to form a sep. plastic mass, and reducing the latter to pulverulent form while it still contains  $H_2O$  of hydration.

**Hydrating dolomitic or magnesian lime.** C. WARNER and I. WARNER. U. S. 1,284,505, Nov. 12.  $CaO$  containing  $MgO$  is first mixed with sufficient  $H_2O$  to hydrate



the CaO while under atm. pressure and the hydration of the MgO is afterward effected in a closed vessel under pressure. This treatment produces a hydrated material which forms readily worked mortars of good strength.

**Luting composition.** S. TAMARI. U. S. 1,281,702, Oct. 15. An acid-proof luting compn. suitable for use on vessels of reinforced concrete is formed by mixing molten S 1 with graphite 3 parts and stirring and applying the mixt. after heating it to about 170°. Paraffin may also be added to the mixt.

**Potassium compounds from cement flue-dust.** F. S. MOON. U. S. 1,283,261, Oct. 29. Cement-kiln flue-dust containing difficultly sol. K compds. is heated to just slightly below the sintering temp. by contact with hot gases free from siliceous ash. A portion of the K content of the dust is thus volatilized and collected, in sol. form. The residue may be leached or used directly as a fertilizer.

**Tile or paving-block for walls or floors.** H. R. WARDELL. U. S. 1,281,444, Oct. 15. Tiles or similar molded articles are formed of a mixt. of granulated cork 60, sand 20, limestone dust 10 and hard asphalt 10 parts. The limestone dust fills the voids between the larger particles of sand and the sand and limestone dust together fill the voids between the particles of cork.

**Plastic paving composition.** E. L. SHARPNECK. Can. 184,720, June 4, 1918. A compn. for pavement contains a finely divided filler, mineral asphaltum, SiO<sub>2</sub>, iron oxide, Al<sub>2</sub>O<sub>3</sub> and SO<sub>2</sub>.

**Rendering wood dense.** HOLZVEREDELUNG, G. M. B. H. Swiss 78,284, July 1, 1918. The wood is covered with pitch, asphalt, resin, thick glue solns., or the like, and subjected in a suitable vessel to a high pressure at a temp. of 90-150°.

**Preserving wood.** J. A. DECEW. U. S. 1,283,105, Oct. 29. Wood is heated to practically a charring temp. in a soln. of coal-tar pitch to expel the moisture from the wood and impregnate the outer portion with the pitch. The wood is subsequently given a coating of a harder pitch.

**Composition for preserving wood.** J. A. DECEW. U. S. 1,283,104, Oct. 29. A wood-preserving compn. is formed by dissolving rosin and creosote oil in a soap soln. and dilg. this soln. by forcing it into hot H<sub>2</sub>O.

**Treating sweet gum wood to prevent warping.** R. L. GILLIAM. U. S. 1,283,495, Nov. 5. Sweet gum wood is treated to prevent warping and twisting, by the action of steam mixed with an alkali such as Na<sub>2</sub>CO<sub>3</sub> soln.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Santo Tomas cannel coal,** Webb Co., Texas. GEORGE H. ASHLEY. U. S. Geol. Survey, *Bull.* 691-I, 251-70(1918).—This "is probably the largest body of cannel coal of bituminous rank in the U. S., if not in the world." It is a bright, glossy black coal almost like pitch in appearance; firm, yielding 75 to 80% lump as mined and screened over 1.25 inch bars. Chem. analyses show this coal to be high in volatile matter, which averages about 25% higher than the fixed C, the fuel ratio of fixed C divided by the volatile matter being about 0.8. The B. t. u. range is from 11000 to 14000; moisture is remarkably low, about 4%; ash, 16; S, 2; and H, 5.75%. The N content ranges from 0.5 to 1.5%, which suggests distn. for ammoniacal and N derivatives of benzene, but the gas and oil are largely unsatd. hydrocarbons and are given off at such low temps. that the desired N by-products are not obtained. Upon distn. one ton yields 7000 cu. ft. of gas consisting of illuminants, 5.4; CO, 6.6; H, 42.0; CH<sub>4</sub>, 39.0; N, 6; B. t. u.

per cu. ft., 700. The coke residue from distn. contained volatile matter, 5.0; fixed C, 75.0; S, 2.0; ash, 18; B. t. u., 12000; yield of coke, 62%. The mines and operations are described at length.

L. W. RIGGS.

The carbonization of coal. J. W. COBB AND S. F. DUFTON. *Chem. Trade J.* 63, 197-8(1918); *Gas World* 69, 127-32(1918); *Gas J.* 143, 482-7(1918).—In a stream of N rich in  $C_6H_6$  decompn. of the  $C_6H_6$  started at  $550^\circ$  and a small quantity of diphenyl was formed. As the temp. rose it was produced in large quantities together with H. In the material deposited at higher temps. diphenylbenzene occurred. At  $750^\circ$ , 32 g. of these compds. accompanied 115 g. of unchanged  $C_6H_6$ . On using  $C_6H_6$  highly dild. with N, the decompn. was lessened and the yield of diphenyl lowered. On substituting H for the N the decompn. of the  $C_6H_6$  vapor was lessened. By gradually diluting further with H, the amt. of molecular condensates produced at  $750^\circ$  diminished until, when only 8% of benzene vapor was present in the gas mixt., only traces of diphenyl were produced. By further expts. the condensation of  $C_6H_6$  to diphenyl was proved to be reversible. The solid condensates obtained from the  $C_6H_6$ -N mixts. at  $750^\circ$  contained no naphthalene and no unsatd. compds., nor did they yield pitch on distn. Very little C was deposited at  $900^\circ$ , even in high dildn. with H, benzene was freely decomposed with the deposition of gray methane C. On vaporizing  $C_6H_6.CH_3$  and carrying it through coke with a stream of N at  $550^\circ$ , decompn. occurred and at  $600^\circ$  enough stilbene formed to permit of its identification. At the same time an oily substance was formed. At higher temps. increased decompn. was noted and at  $750^\circ$  it was quite extensive. The solid products of decompn. on examination yielded naphthalene and anthracene and consisted partially of unsatd. substances yielding a viscous black liquid on washing with  $H_2SO_4$ . On substituting H for N as the carrier gas, the decompn. of  $C_6H_6.CH_3$  was greatly accelerated with the production of large amts. of  $C_6H_6$  and smaller amts. of solid condensates. The gas collected at the end of the train contained about 50%  $CH_4$ . During coal carbonization, the formation of molecular condensates such as stilbene occurs with liberation of H. If a large quantity of H is present initially the action is checked. By acting directly on the  $C_6H_6.CH_3$ , however, the H atm. reduces it to  $C_6H_6$  and liberates  $CH_4$ . This action is reversible. On passing a mixt. of  $CH_4$  and  $C_6H_6$  through red-hot coke at  $750^\circ$  and examining the products, these consisted of undecomposed  $C_6H_6$  with some diphenyl and a small quantity of  $C_6H_6.CH_3$ . The main difference between the decompn. of  $C_6H_6$  and  $C_6H_6.CH_3$  lies in the action of H. The decompn. of xylene having a b. p. of  $138-40^\circ$  in an atm. of H was similar to that of  $C_6H_6.CH_3$ , yielding  $C_6H_6.CH_3$  and  $C_6H_6$  by reduction and a limited quantity of solid condensates. Cresol, the characteristic constituent of the cresol fraction in tar distn., is also reduced at  $750^\circ$  in a stream of H to  $C_6H_6$  and  $C_6H_6.CH_3$ . By treating the coke from carbonization with steam and H, a considerably larger proportion of  $NH_3$  than is recovered by any ordinary carbonization process is obtained.

E. A. TSCHUDY.

The carbonization of coal. W. SAVAGE. *Chem. Met. Eng.* 19, 579-82(1918).—From  $215$  to  $25^\circ$  F. moisture is removed from the coal, from  $300$  to  $400^\circ$  F. a slight superficial softening of the coal occurs and some gases are given off but the character of the fuel is substantially unaltered. At  $450^\circ$  F. decompn. into paraffin oils, gases, and solid substances begins, the mass fuses, swells and loses wt. and if distn. is completed a porous coal is left. At  $750^\circ$  F. new gases and vapors are liberated accompanied by a marked increase in the volume of the mass, and the development of a very porous cellular structure. At  $825-980^\circ$  F. the liberation of oil is more rapid and in one hr. a 36% vol. coal is reduced to 18% and the apparent sp. gr. of the residue is about 0.75. At very high temps.,  $1500-3000^\circ$  F., the volatile hydrocarbons are practically entirely removed and the C residue is fused to great hardness. For metallurgical coke,

the beehive oven yields a satisfactory product from 32% volatile coals; with by-product coking ovens the best results are obtained by using coals containing 23-8% vol. matter. In the manuf. of carbocoal by the Smith process 30 gals. of water-free tar is produced per ton of 35% volatile coal. This tar contains no naphthalene, anthracene nor carbollic acid but is rich in oils, tar acids and cresols. Standard by-product coke-oven practice produces only 7.5 gals. of tar per ton of raw coal. The Smith process will release vast amounts of petroleum fuel and will furnish great quantities of coal-tar products.

E. A. TSCHUDY.

**Chemical engineering in modern gas works.** WILLIAM A. TWINE. *Gas J.* 144, 369-71(1918).

E. H.

**How war affected the German gas industry.** ANON. *Gas Age* 42, 378-80(1918).

E. H.

**Formation of aromatic hydrocarbons from natural gas condensate.** J. G. DAVIDSON. *J. Ind. Eng. Chem.* 10, 901-10(1918).—A study of the effect of catalyzers on the decompn. of straight-chain hydrocarbons of low mol. wt. The results are given of an investigation of the influence of temp. and pressure on the production of aromatic hydrocarbons.

J. H. YOUNG.

**Quantitative determination of suspended tarry matter.** F. W. STEERE. *Chem. Met. Eng.* 19, 686-9(1918).—After all the methods suggested in the literature for estg. suspended tarry matter in gas had been tried, the "tar camera" was devised and found most satisfactory. The "tar picture" is a piece of special white paper through which a certain amt. of gas has been drawn, the tar being filtered out on the paper and estd. either by comparison with a standard paper or more accurately by weighing under a standard condition of humidity before and after taking the "picture." The "camera" is simple in design; it is merely a pipe tapped into the source of the sample and leading through a cock to an enlarged portion in which are set easily removable gaskets holding the paper. The gas is led out the other side and through a meter or aspirator bottle for measurement. Pictures of the app. together with curves showing the rate of absorption of moisture by paper and its variations with humidity are given. The article also suggests the advantage of removing the tar on a commercial scale by means of electrostatic rather than mechanical methods.

R. H. SAWENS.

**Machine shop for gas producer work.** ANON. *Iron Age* 102, 1373-8(1918).—An illustrated description of the new plant of the Smith Gas Engineering Co., of Dayton, O., with a discussion of producer operation for power purposes.

E. J. C.

**Methods of analysis used in the coal-tar industry. III. Heavy and middle oils.** J. M. WEISS. *J. Ind. Eng. Chem.* 10, 911-6(1918); cf. *C. A.* 12, 2681.—The methods used by the Barrett Co. for the analysis of heavy and middle oils are described in detail with illustrations of app. The accuracy of the methods is given.

J. H. YOUNG.

**The formation of coke.** GEORGES CHARPY AND MARCEL GODCHOT. *Compt. rend.* 167, 322-4(1918); cf. *C. A.* 11, 2402.—By the method described in the previous paper, attempts were made to improve the resistant qualities of coke. By mixing 2 coals, with, resp., high and low content of volatile matter, in varying proportions the strength of the coke can be varied. Coke from mixts. with less than 20% of rich coal was very friable; as the % of rich coal increased its strength rose steadily to 80 kg. per sq. cm. at 51%, but fell to 0 at 56%. Another method is to coke the rich coal alone slowly at low temp. (preferably about 450°). A coke of normal strength can often be obtained thus, but too long heating will make it powdery. Still another method is the addition of pitch or tar to a poor coal. Coke with strength as high as 130 kg. per sq. cm. can be obtained in this way. No definite relation can be established

between temp. and time of distn., or % of volatile matter, and the strength of the coke; the optimum conditions for each case must be detd. by expt. I. F. SMITH.

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Utilization of Argentina raw materials (TERÁN, PENNA) 16.

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BONE, W. A.: **Coal and its Scientific Uses.** New York: Longmans, Green & Co. 491 pp. \$7.00.

OORTGISJEN, M. F.: **Teerstoffen.** Amsterdam: L. J. Veen. 50 pp. f. o.75.

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**Fuel-briquet.** C. H. SMITH. U. S. 1,284,939, Nov. 12. Briquets are formed of partially carbonized coal mixed with such a proportion of pitch or a similar binder that the briquet contains 11-17% of volatile materials.

**Briqueting coal.** E. R. SUTCLIFFE. U. S. 1,283,354, Oct. 29. Finely divided coal or similar material to be briqueted is compressed, broken into lumps and again compressed to form blocks or briquets, which are hard and tough. Cf. C. A. 12, 2050.

**Motor fuel.** F. J. H. RUSTIGE. Can. 187,630, Nov. 26, 1918.  $\text{CaC}_2$  in a permeable container is immersed in alc., the proportions of  $\text{CaC}_2$  to alc. being regulated so that the acetylene formed is dissolved in the alc.

**Artificial fuel.** P. LAMBERTY. Brit. 119,443, May 4, 1918. Coal dust, coke dust, and the like are mixed with lime, and the mixt. is damped and molded under high pressure into briquets. These briquets are exposed to the action of steam under pressure in a boiler.

**Producing gas.** B. F. MCKEE. U. S. 1,282,445, Oct. 22. Gas is produced by feeding coal dust or similar carbonaceous material into a rotatable container inclosing a pair of electrodes which gasify the fuel by the action of an electric arc.

**Gas-producer.** C. W. LUMMIS. U. S. reissue 14,548, Nov. 12.

**Gas-producer.** E. A. W. JEFFERIES. U. S. 1,284,694, Nov. 12.

**Gas-producer.** H. C. PERDUE. U. S. 1,284,138, Nov. 5.

**Rectifying still for recovery of benzene and its homologues.** F. TSCHUDY. U. S. 1,282,324, Oct. 22.

**Recovering benzene, toluene and other vaporized or gaseous constituents from coal gas.** R. LESSING. U. S. 1,281,597, Oct. 15. For the purpose of recovering  $\text{C}_4\text{H}_6$ , toluene and their homologs,  $\text{C}_{10}\text{H}_8$  and other hydrocarbons and removing  $\text{CS}_2$  from coal gas, the gas is passed through a closed vessel, which is charged with broken or definite shapes of brick, coke or other porous material such as charcoal, pumice, slag or glass or stoneware previously soaked in heavy tar oil, petroleum oil, pitch or bitumen (from which all low-boiling constituents have been removed by distn.) or S or other suitable substances. The vaporous substances with which the coal gas is more or less satd. and which are liquid at ordinary temps. when isolated are absorbed by the oil. Subsequently steam is blown through the absorption vessel and the vapors thus driven off are led to a condenser and sepg. app. For the removal of  $\text{CO}_2$  from gas, a porous material impregnated with  $\text{Na}_2\text{CO}_3$  may be used. Picric acid may be used as a reagent for selective removal of  $\text{C}_{10}\text{H}_8$ , which is then driven off by superheated steam. An app. is described for carrying out the absorption and distn.

**Heating fusible material by surface combustion.** C. D. MCCOURT. Can. 187,660, Nov. 26, 1918. An explosive gaseous mixt. is injected into and through a fusible material at a speed greater than the normal speed of backfiring. Surface combustion of the explosive mixt. is effected in contact with the molten material which is

agitated by the movement of the gases therethrough. The explosive gases contain a component capable of chemically combining with the fusible material. A modification shows the fusible material fed into contact with a bed of heated refractory material for accelerating combustion.

**Gas for welding and cutting metals.** R. H. BROWNLEE. Can. 187,637, Nov. 26, 1918. A H and hydrocarbon product is made by bringing a suitable hydrocarbon into contact with a highly heated refractory material in an enclosing chamber in the absence of air and a suitable pressure, the product is cooled to sep. the H from the C and gases of the ethylene series may be added.

**Obtaining and distilling oils from coal gas.** D. MARBAIS and C. DEGUIDE. Brit. 118,730, Nov. 1, 1917. Coal gas is washed with an absorbent, the satd. absorbent is distd. for the regeneration of the absorbent, and the vapors obtained by distn. are divided into three fractions, namely 90% benzene, 50% benzene, and a mixt. contg. naphthalene and an oil or spirit of the nature of solvent naphtha. The coal gas is washed with tar oil or anthracene oil in a tower packed with wood shavings, metal waste, shavings and turnings of Fe or steel, etc. App. is specified.

**Ammonia.** A. H. LYMN and N. E. RAMBUSH. Brit. 119,049, June 13, 1917. To sep.  $\text{NH}_3$  from steam and tar contained in producer gas, and to obtain from the  $\text{NH}_3$  clean salts of any acid, the gaseous mixt., after it has been washed in known manner at a temp. of about  $80^\circ$  in  $\text{H}_2\text{O}$  which may contain lime, is passed through a tubular or like condenser, or condensers, arranged to act as reflux condensers, the part of the condenser at which the mixt. enters being kept at such a temp., *e. g.*,  $80^\circ$ , that the steam and tar are simultaneously condensed, but any  $\text{NH}_3$  which condenses with them is immediately volatilized. The other end of the condenser system is kept at such a temp., *e. g.*,  $40^\circ$ , that practically all the steam and tar are condensed but not the producer gas and the  $\text{NH}_3$ , which are passed through a tar separator to remove final traces of tar. The  $\text{NH}_3$  is then converted into any desired salt by passage through an acid, and the gas is left in a pure condition. Any  $\text{NH}_3$  which is contained in the condensate from the reflux condenser is volatilized by any known method. Two or more condensers in series or parallel may be used, and free spaces in which the gases and vapors are stated to mix may be arranged between the tube plates of adjacent condensers. The air blast for the producer may be heated by the  $\text{H}_2\text{O}$  from the condensers, and in one form of heating and satg. this blast with moisture, the blast is passed between the two tubes forming the condenser, and the  $\text{H}_2\text{O}$  is used in the form of a film or spray.

**Peat.** C. BOUILLON. Brit. 118,993, Mar. 15, 1918. Vegetable fibers are sepd. from peat and graded, and the peat is freed from foreign matters and brought to a pure and dry state by a continuous process. The peat, as it comes from the bog, is fed through a hopper into an app. by which it is rolled, molded, torn, or crumbled, and then it is carried by a draining conveyer to a tank; the conveyer is preferably given a shaking motion. In the tank is a soln. of a salt capable of coagulating blood, *e. g.*,  $\text{CaCl}_2$  or  $\text{Fe}_2\text{Cl}_6$ , and the peat is treated with this during its passage through the tank by the action of a rotary conveyer. The peat and soln. pass, by the aid of a jet of compressed air, along a pipe into a rotary sieve, which is a wire gauze cylinder secured to hoops supported by rollers above a trough. The sieve retains the fibers which are discharged into a launder, the discharge being assisted by jets of  $\text{H}_2\text{O}$  from pipes. Two or more sieves may be used in succession to effect a grading of the fibers. Earth, sand, and other foreign matters are removed from the peat by running the soln. and peat through a settling tank which may have an agitating pump and partitions dividing the tank into compartments, which can be separately emptied. The peat is air-dried, washed to remove the chloride, and dried in a drying room.

**Coke product of low density.** H. RODMAN. U. S. 1,283,310, Oct. 29. Coal or similar coking material is formed into pellets or fragments and heated to a coking temp. to produce a material which is suitable for filling reaction towers or for use as a filtering material.

**Heating coke-ovens.** R. GEIPERT. U. S. 1,281,775, Oct. 15. In heating coke-ovens, alternately burning illuminating gas and producer gas, illuminating gas is burned within a gas producer containing a column of fuel maintained in a state of incandescence by the heat generated by the burning illuminating gas, combustion products are passed through the incandescent fuel and the combustible gases thus formed are burned in the coke-oven.

**Coking pitch.** R. A. LEE. U. S. 1,283,229, Oct. 29. Pitch or similar material is heated under a pressure of several atm. to a temp. above  $315^{\circ}$  and the pressure is then reduced by causing the vapors and gases to expand in a confined space under atm. pressure while still heated. Portions of the material, thus coked, are sepd. from uncoked material.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

**Production and consumption of crude petroleum and other mineral oils.** 65th Congress, 2nd Session, Senate, *Document* 280, 16 pp.(1918).—A letter from Director Van H. Manning of the Bur. of Mines to the President of the Senate containing statistical information.

E. J. C.

**Action of aluminium chloride on petroleum.** AMÉ PICTET AND I. LĘCZYŃSKA. *Arch. sci. phys. nat.* 44, 400-1(1917).—When an upper fraction of petroleum distillates such as kerosene, lubricating oil or paraffin, is slowly heated with a small quantity (about 10%) of  $AlCl_3$ , the salt dissolves, imparting a dark brown to the soln. If this brown liquid is then submitted to fractional distn. the fraction between  $40^{\circ}$  and  $140^{\circ}$  possesses all the properties of natural petroleum benzine and may serve the same purposes. The nature of artificial benzine obtained varies with the nature and origin of the initial product; the kerosene oil of Galicia furnishes 50% of its weight, that of Bakau 40, lubricating oil of Bakau 31, Galician paraffin 35, etc. If, after the first fraction is sepd., the distn. is carried to  $400^{\circ}$ , products of more or less weight are obtained and there remains finally a black viscous residue which, after the  $AlCl_3$  is removed by aq. lixiviation, is similar to asphalt. The quantity of this residue varies from 11 to 56% by wt. of the original material, depending on the origin of the petroleum. The authors studied particularly the benzine and the solid residue obtained from the lubricating oil of Bakau (d. 0.907, upper b. p.  $300^{\circ}$ ). The benzine contains a mixt. of 35% of satd. hydrocarbons of the fatty series ( $C_{14}H_{30}$  and  $C_{16}H_{34}$ ) and 65% of satd. cyclic hydrocarbons ( $C_7H_{14}$  and  $C_8H_{18}$ ). Its calorific power is greater than that of natural benzine obtained by simple distn. of crude petroleum from the Caucasian region (11,386 cal. instead of 11,200), due to the fact that natural benzine contains only  $C_nH_{2n}$  hydrocarbons, while about  $\frac{1}{3}$  of artificial benzine consists of aliphatic hydrocarbons ( $C_nH_{2n+2}$ ). The formation of these last under the influence of  $AlCl_3$  is probably due to a sepn. of open side chains which are attached to satd. naphthene nuclei. These chains entrain with them hydrogen atoms from the nuclei with a consequence that the nuclei become unsatd. aromatic hydrocarbons. The unsatd. compds. thus formed have a great tendency to polymerize and it is this polymerization which gives rise to the solid residue so closely resembling asphalt.

J. H. YOUNG.

**Utilization of Italian products for the production of benzene.** II. A. G. RODANO. Rome. *Ann. chim. applicata* 10, 23-6(1918).—R. analyzed a new oil occurring in

Pavia. It was a pale pink liquid with bluish fluorescence, insol. in aniline, and having a characteristic mineral-oil odor, quite different from the odor of ordinary petroleum. It showed a neutral reaction to turnsole paper,  $d_{15}$  0.9132; Engler viscosity at 20° 1.77; flash point (Pensky-Martens) 80°; calorific power 10600 cal.; total S 0.22%. It began to distil at 180° with partial decompn. and development of vapors. The fractions distilling at 180–250°, 250–80, 280–310, 310–60, 360–70°, and residue at 370° were resp. 26, 26, 18, 18, 6, 6 cc. and had resp.  $d_{15}$  0.8826, 0.967, 0.9281, 0.949, 0.954, 1.006. The residue was black, dense and of the consistency of vaseline. It is evident from the high densities above that the oil does not contain either light benzine or kerosene adaptable to illuminating purposes. It is not suitable for lubrication because of its low viscosity and flash point. It would find its best use as a combustible. With the idea of finding a higher value for the oil, L. subjected it to cracking expts. (cf. C. A. 11, 3420). From 500 cc. of the crude petroleum were obtained 125 l. gas and 150 cc. of a black, tar-like liquid sol. in aniline (unlike the crude oil) and having a strong aromatic odor. The 150 cc. of this tar gave, on fractional distn., between 75 and 170°, 70 cc. of a limpid oil, slightly yellowish, of  $C_6H_6$  odor, and  $d_{15}$  0.872. This latter fraction, on new distn. up to 122°, gave 45 cc. of oil of  $d_{15}$  0.866, that could be completely nitrated. The nitrated product was insol. in  $H_2O$ , had an odor of nitrobenzene, and when distd. in a current of  $H_2O$  vapor yielded a straw-yellow liquid of bitter almond odor, b. 208–25°,  $d_{15}$  1.1833, indicating a mixt. of nitrobenzene and *o*-nitrotoluene, the latter in excess. The gaseous product obtained from decompn. of the crude oil was combustible, gave a luminous flame, and had an odor resembling that of acetylene. In all probability it was rich in aromatic hydrocarbons, recoverable by passing through heavy tar-oil. The decompn. of 100 parts of the crude oil yielded 25 l. combustible gas, 9 cc. oils distg. up to 122°, 5 cc. oils distg. between 122 and 170° and 16 cc. residual tar. The yield of benzene-toluene from the crude oil was about 12 times greater than that from an equal wt. of coal, not including the aromatic hydrocarbons recoverable from the gases of decompn.; considerable quantities of higher homologs (xylene, etc.) are no doubt present. R., for a further study, sepd. the crude oil into 2 fractions by ordinary distn., one below and the other above 280°. The latter fraction was a reddish brown liquid, amounting to 48% by wt.,  $d_{15}$  0.942, Engler viscosity at 20° = 5.55. Properly treated, it could be used as a good lubricant. R. subjected the lower fraction (distillate up to 280°) to "cracking," and obtained combustible gas and a tar with aromatic odor which yielded 4.78% benzene-toluene, based upon the crude oil.

ROBERT S. POSMONTIER.

**Asphalt,** related bitumens, and bituminous rock in 1917. JOHN D. NORTROP. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part II, 232–51 (Preprint No. 18, published Oct. 22, 1918); cf. C. A. 12, 93.

E. H.

**Utilization of elm.** W. D. BRUSH. U. S. Dept. Agr., *Bull.* No. 683, 43 pp. (1918). —The classified uses of elm in different wood-using industries are given. J. J. S.

**Petroleum in Japan (CLEMENTS) 8.** Salt Creek oil field, Wyoming (WEGEMANN) 8. Dehydrating emulsions (petroleum and water) (U. S. pat. 1,281,952) 18.

**ABRAHAM, HERBERT:** *Asphalts and Allied Substances, their Occurrence, Modes of Production, Uses in the Arts and Methods of Testing.* New York: D. Van Nostrand Co. 606 pp.

**Separating lighter from heavier hydrocarbons by distillation.** F. A. HOWARD. U. S. 1,284,687, Nov. 12. In sepg. gasoline components from kerosene hydrocarbons,

or sepg. similarly differing hydrocarbons from each other, about equal vols. of the hydrocarbons and of cold  $H_2O$  are placed in a still and the liquids are heated therein so that the temp. of the vaporized contents of the still will not exceed about  $98^\circ$ , to distill off the lighter hydrocarbons.

**Removing paraffin or similar impregnating material from paper.** W. O. GAYNOR. U. S. 1,284,647, Nov. 12. Paraffin present as coating or impregnating material in paper is removed from the paper by immersing in gasoline or other liquid with which the impregnating material is freely miscible only when fused and the liquid surrounding the paper is heated to a temp. sufficiently high to fuse the impregnating material and to cause the convection currents to agitate the paper and diffuse the impregnating material throughout the liquid. The liquid and fused material are then drawn off.

**Gasoline.** J. B. WEIR. U. S., 1,282,338, Oct. 22. Gasoline is extd. from natural gas by compression and cooling, partially denuded gas being subjected to an absorption process. The products thus derived are blended and their vapor tension is reduced by driving off a portion of the more volatile constituents to obtain the finished product. A portion of these volatile constituents is absorbed in a hydrocarbon liquid heavier than gasoline and this product is used as the absorbent for the first mentioned absorption step.

**Distilling oils.** H. H. MANDLE. Brit. 119,284, Sept. 27, 1917. Hydrocarbon oils of a relatively low b. p., such as gasoline, benzene, toluene, etc., obtained from heavier oils of a high b. p. by mixing the heavy oil in predetd. proportions with  $H_2O$ , spraying the mixt. into a heating chamber or tubes heated to a temp. of from  $250$  to  $675^\circ$ , and subjecting the mixt. to the action of a catalytic agent consisting of an alloy of Ni, Cr and steel placed at the outlet end of the chamber or tubes, the mixt. being then passed through an oil-cooled primary condenser for removing the uncracked oils, and a water-cooled secondary condenser for condensing the hydrocarbons of lower b. p. The alloy may be in the form of woven wire or may be included in the compn. of the walls of the cracking tubes; or a stirrer or scraper may be made of the alloy. The pressure in the heating chamber or tubes may vary from atm. to 600 lb. per sq. in. A suitable app. is specified.

**Cracking oils; burners.** A. B. ADAMS. Brit. 119,485, July 5, 1917. Hydrocarbon oils are cracked for the production of low-boiling hydrocarbons, gas, etc., by mixing them with steam, passing the mixt. through a cracking chamber, and then, at the exit of the cracking chamber, bringing the products into contact with a finely attenuated mass of catalytic metal. A burner supplied with a mixt. of oil and steam also is described.

**Distilling and cracking oils.** D. T. DAY and R. B. DAY. Brit. 119,440, Nov. 16, 1917. Hydrocarbon oils are vaporized by causing hot products of combustion free from O to bubble through them. The process is used for removing gasoline from oils that are subsequently to be cracked by spraying into hot products of combustion under pressure as described in 113,264. Hot gases formed by combustion in a suitable chamber are led by a conduit into a cracking chamber into which oil is sprayed by a nozzle. The hot gases, together with the products formed by cracking at a temp. of at least  $360^\circ$ , are led to a perforated pipe in the base of the vaporizing chamber. The gases after bubbling through the oil are fed, together with the gasoline formed by vaporization, by a pipe to a fractionating tower maintained at least at  $190^\circ$ . The low-boiling hydrocarbons that escape condensation are led by a pipe to a condenser. The crude oil under treatment enters the fractionating tower by a pipe and trickles downwards. The oil thus heated, together with products formed by condensation, flows through a pipe to the vaporizing chamber. The oil after it has been freed from gasoline in the vaporizing chamber is pumped through a pipe to the spraying nozzle.



**Hydrocarbon oils.** D. T. DAY and R. B. DAY. Brit. 119,441, Nov. 16, 1917. Gasoline is purified by bubbling it through  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}$ , and  $\text{NaOH}$  in succession. The operation is effected in a series of washing app. containing the reagents, the gasoline being admitted by means of pipes fitted at their lower ends with spray devices. The gasoline rises to the top and flows away by a pipe. The app. is used in combination with the plant for cracking oils by spraying into hot products of combustion that is described in 113,264 (C. A. 12, 1347) and with the plant for pre-distg. the crude oil and fractionating and condensing the vapors that is described in 119,440. (See *supra*.)

**Hydrocarbon oils.** R. H. BROWNLEE. Can. 185,052, June 25, 1918. The yield of low boiling liquid products is increased by introducing steam adjacent the lower extremity of a vertically extending pipe system maintained at a temp. of over  $800^\circ\text{F}$ . and a pressure of over five atm., introducing the oil below the upper extremity of the system, continuously sepg. the heavier components from the lighter vaporized products and permitting a reflux of the former through the system so that the heavier components sepg. at any point undergo a further treatment in the presence of a lesser concn. of the lighter products than of the point of their sepn.

**Hydrocarbon extraction.** V. Z. READ. Can. 185,181, June 25, 1918. Shale or coal is submitted to destructive distn. in one chamber, the distillate is passed into a second chamber containing similar shale or coal to dissolve material from the shale and the solvent and extracted matter are recovered.

**Liquid fuel.** T. PAYNE. Brit. 119,066, Sept. 6, 1917. A fuel analogous to gasoline is obtained by subjecting hydrocarbon oils derived from petroleum, asphalt, bitumen, resin, bituminous shale, etc., to a treatment consisting in lowering the temp. and increasing the pressure of the liquid in successive stages and at each stage introducing a fuel gas, the product being thereafter restored to substantially atm. pressure and temp. E. g., kerosene may be reduced to about  $32^\circ\text{F}$ . under 6 atm. pressure and about 5 vols. of coal gas forced in; the pressure may then be increased to 8 atm. and the temp. lowered to about  $0^\circ\text{F}$ . and about 8 vols. of Pintsch gas introduced; or coal gas, acetylene, and H may be successively introduced into kerosene at temps. and pressures ranging to  $-32^\circ\text{F}$ . and 15 atm. The product is preferably kept under a pressure slightly above atm.

**Oil-still.** O. C. SWAN. U. S. 1,283,945, Nov. 12. The still is especially adapted for reclaiming waste oil from internal-combustion engines.

**Retort for recovering values from oil-bearing shales, bitumens, and similar materials.** J. H. GALLOUPE. U. S. 1,283,723, Nov. 5.

**Apparatus and mode of operating for distilling petroleum oils.** E. A. JOHNSON and W. SNODGRASS. U. S. 1,283,202, Oct. 29.

**Apparatus for distilling oil from oil-shale or similar materials.** G. W. WALLACE. U. S. 1,283,000, Oct. 29. Suction pipes are connected to perforated take-off pipes placed within vertical retorts. U. S. 1,283,001 relates to a method of operating such an app. in which the material treated is placed in a vertical closed retort, externally heated, gases and vapors and liquids being drawn off under suction through a perforated pipe extending into the central part of the retort from the bottom of the latter.

**Diolefins.** G. MERSEREAU. U. S. 1,282,906, Oct. 29. Oil gas is heated to about  $700^\circ$  to produce a mixt. of hydrocarbons containing a considerable % of diolefins, cooled to remove residual oil and the diolefins are recovered from the mixt. thus obtained by scrubbing with wash oil at zero. The remaining gas may be reheated to produce a further quantity of diolefins.

**Apparatus and process for cracking petroleum oils.** M. J. TRUMBLE. U. S. 1,281,884, Oct. 15. Heavy petroleum oil is first forced through a heating coil heated

sufficiently to crack the oil, at such a rate and under such pressure as to form a foam within the coil without danger of unduly burning the oil. Light vapors are removed from the stream of oil and the residual oil, after removal of the vapors, is passed through the heating coil to form more foam. The process is thus carried out in a cycle; small amts. of fresh oil are added as required and portions of condensed vapors and heavy oil and solid materials are withdrawn in compensating ratios.

**Apparatus for extracting and refining oils.** E. T. ERICKSON. U. S. 1,281,320, Oct. 15. The app. is arranged to treat oil-bearing shale in narrow metal retorts. Perforated pipes extend within the retorts and serve for the exit of vapors and gases from the retorts.

**Treating used lubricants.** J. O. HANDY. U. S. 1,281,354, Oct. 15. Used lubricants (such as those which have been employed for lubricating internal-combustion engines) are dissolved in gasoline or a similar hydrocarbon solvent, suspended solid matter is removed from the soln., the soln. is decolorized (e. g., by treatment with bone-black or fuller's earth), treated successively with an alkali and acid, neutralized and washed and the solvent is distd. off. The product thus recovered is adapted for re-use. U. S. 1,281,355 relates to similar process, except that the treatment with acid is omitted.

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### 23. CELLULOSE AND PAPER.

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A. D. LITTLE.

**Cellulose and nitrocelluloses.** A. HERVÉ. *Mon. sci.* 8, 193-6(1918).—The stability of nitrocellulose is considerably affected by the value of the ratio  $H_2SO_4/HNO_3$ . By varying this ratio from 1:1 up to 5:1 the amt. of fixed  $H_2SO_4$  in the nitrocellulose increases from 0.0505 to 1.860%. The stability (Abel test) of the nitrocellulose after boiling 8 hr. with  $H_2O$  varied inversely with the amt. of  $H_2SO_4$  in the nitrating mixt. Nitrocellulose can be stabilized by boiling with  $H_2SO_4$  and  $HCl$  (0.2 to 1.0%), followed by boiling with a dil. alkali. The sapon. of the impurities is, however, slow. More satisfactory results are obtained by boiling the nitrocellulose with 0.1 to 1% of its wt. of  $MgCl_2$  for 12 hr. Nitrocellulose so stabilized with  $MgCl_2$  gave a test of over 60 min. (Abel).

R. B. ROG.

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**Lignin.** I. Lignosulfonic acid (HÖNIG, SPITZER) 10. Dyes from waste sulfite liquor (U. S. pat. 1,283,296) 25.

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**STRACHAN, JAMES:** *The Recovery and Re-Manufacturing of Waste Paper.* Aberdeen: The Albany Press. 158 pp. 12s. 6d.

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**Method for producing the zinc chloride solution of cellulose.** W. OGAWA. *Can.* 187,349, Nov. 5, 1918.  $ZnCl_2$  soln. is heated to about  $100^\circ$  in the presence of an excess of  $ZnCl_2$  sufficient to sat. the soln. at the temp. attained, and cellulose is added. It dissolves in this soln. in a very short time, producing a practically colorless soln. which gives a strong film or thread after coagulation.

**Digester and associated apparatus for the manufacture of cellulose.** E. SCHAUFFELBERGER. U. S. 1,282,635, Oct. 22. The app. is especially adapted for the manuf. of pulp from wood, bamboo or esparto.

**Alcohol and other products from waste sulfite liquor.** R. H. MCKEE. U. S. 1,284,739, Nov. 12. Waste sulfite liquor is purified by treating it with  $BaCO_3$  under oxidizing conditions, thus forming a sludge containing  $BaSO_4$  and, after sepg. the sludge,

the purified liquor is fermented and distd. to obtain alc. The sludge is furnaced under reducing conditions to obtain BaS and the latter is then converted into BaCO<sub>3</sub> by treating it under pressure with CO<sub>2</sub> from the fermentation vats.

Alcohol from waste sulfite liquor. R. H. McKEE. U. S. 1,284,740, Nov. 12. Waste sulfite liquor is subjected to the action of BaS under oxidizing conditions, forming a sludge containing BaSO<sub>4</sub> and eliminating injurious S compds. and the sludge is furnaced under reducing conditions to regenerate the BaS. The purified liquor is fermented with yeast.

Mixed ketones for use as solvents. H. HIBBERT. U. S. 1,283,183, Oct. 29. A mixt. suitable for use as a solvent for nitrates and other esters of cellulose is made by fermenting distillery slop so as to obtain a product rich in butyric acid, converting the acids of this mixt. in vapor form into the corresponding ketones by catalysis with an oxide of Th, Ce, Zr or U and then hydrogenating and acetylating the product. The mixt. formed contains a large proportion of butyrene, b. 110-60° (the greater portion b. 135-45°) and has a sp. gr. of about 0.8. It may be distd. with steam at a temp. somewhat below 100°.

Sulfite wood pulp. V. DREWSEN. U. S. 1,283,114, Oct. 29. Sulfite wood pulp from spruce, hemlock, fir or balsam wood is refined to render it suitable for the manuf. of nitrocellulose, by bleaching for 4-8 hrs. with an aq. soln. of bleaching powder, washing, and then boiling under pressure for several hrs. with an aq. NaOH soln. to dissolve and remove the oxy- and hydrocellulose, washing, and again bleaching with bleaching powder while keeping its soly. in KOH below 7%.

Refining wood pulp. V. DREWSEN. U. S. 1,283,113, Oct. 29. Pine, spruce or similar soda or sulfate process wood pulp is refined to render it suitable for the manuf. of nitrocellulose or other uses by bleaching for several hrs. with an aq. soln. containing 2-8% Cl calcd. on the dry wt. of the pulp and then treating the yellow partially bleached product thus obtained with a boiling Na<sub>2</sub>CO<sub>3</sub> soln. under pressure for several hrs. The soly. of the pulp in KOH is reduced to less than 7%.

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## 24. EXPLOSIVES AND EXPLOSIONS.

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CHARLES E. MUNROE.

Coating paper. C. M. GAGE, JR. U. S. 1,282,564, Oct. 22. A coating material such as a clay mixt. is applied to the surface of paper by means of rolls which force the material into the pores of the paper, the material is partly dried by blasts of air, subjected to smoothing rolls and then given a second or finishing coating.

Cellulose and nitrocellulose (HERVÉ) 23. Pathology and treatment of trinitrotoluene poisoning (FOULERTON) 11H. Electrically heated ovens (ANON.) 4.

BIEDERMANN, R.: *Die Sprengstoffe, ihre chemie und Technologie*. Leipzig: B. G. Teubner. 124 pp. Mk. 1.50.

COLVER, E. DE W. S.: *High Explosives*. New York: D. Van Nostrand Co. 776 pp. \$20.00.

Explosive. C. E. GRIFFING. U. S. 1,282,413, Oct. 22. An explosive stated to be adapted for use as a gun powder is formed of KClO<sub>4</sub> 50, sugar 49, KMnO<sub>4</sub> 0.33, S 0.33 and talcum powder 0.33 part.

**Explosive.** P. E. HAYNES and H. E. THOMPSON. U. S. 1,282,229, Oct. 22. Carbonized balsa wood and liquid O or liquid ozone are mixed to form an explosive.

**Casting explosive charges for projectiles.** P. G. PARIS. U. S. 1,282,623, Oct. 22. The air is exhausted from a hermetically sealed mold provided with a riser and the charge-forming material is then siphoned from a supply of molten material into the mold and riser and while the material in the mold is solidifying the portion in the riser is maintained in molten condition. Air is then admitted to the riser and excess molten material is drained off.

**Nitrating organic compounds.** L. W. ANDREWS. U. S. 1,283,617, Nov. 5. An acid amide, preferably urea, is added (in the proportion of about 1%) to the nitration mixt. used for making nitroglycerin, TNT, picric acid or other org. compds., to diminish risk from rise in temp. and to restrict undesired oxidation of the material undergoing nitration.

**Matches.** L. V. ARONSON. Can. 187,356, Nov. 12, 1918. The head of the match is ignitable by friction. It contains  $\text{KClO}_3$  one part.  $\text{KNO}_3$  two parts, lamp black and P 60 parts each and dextrin 20 parts, all covered with a suitable waterproof compn. This match is found very satisfactory for outdoor use.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**Fastness of colors to light.** G. A. HALCY. *J. Soc. Dyers Colourists* 34, 201-2 (1918).—Referring to the method of standardizing fastness of colors of Robson (*C. A.* 12, 2250), H. draws attention to several deficiencies and errors. The method of judging results as soon as first sign of fading appears is open to criticism. No important details are given of comparing different colors in the same depth of shade. By R.'s method Thionol Corinth G. X. appears to be faster than Thionol Brown O., while repeated comparative tests made by H. show the opposite to be true. It is doubtful that Congo Corinth possesses 3 times the fastness of Congo Rubine, and that certain sulfur browns are equal in fastness to aniline black. The numerical method of recording color fastness possesses disadvantages in the lower scale, for a color fading in two days would be recorded as four times as fast as one fading in four hours, whereas both should be placed in the same category. The method of comparing a color with other colors of known fastness is the best; the method recommended by the German Fastness Commission using 5 or 6 graded standards of each color would be highly desirable.

L. A. OLNEY.

**The production of dyeings fast to light.** K. GEBHARD. *J. Soc. Dyers Colourists* 34, 74-6 (1918).—There are 3 methods differing in principal by which the fading of dyes can be prevented. (1) Dissociation of the equil.  $\text{G}^1 - \text{O}^1 + \text{H}^+ + \text{OH}^- \rightleftharpoons \text{H.O.OO.H} \rightleftharpoons \text{OH}^+ + \text{OOH}^-$  in disfavor of  $\text{OOH}^-$ . Equil. established in darkness will be altered at once by the influence of light. The equil. is influenced by all substances in the system. When it is ascertained what kind of influence takes place under the action of light the equil. can be established by a suitable concn. of substance and when this is not possible new substances may be introduced into the system. With wool and fibers not sensitive to  $\text{H}^+$  and  $\text{OH}^+$  ions favorable results can be obtained if to begin with the equil. is altered in disfavor of the  $\text{OOH}^-$  ions. This condition is produced by increasing the H-ion concn. in aq. solns. of acid dyes. With cotton, however, conditions are different, as it reacts easily with  $\text{H}^+$  and  $\text{OH}^+$  ions. Only if the reaction between the cotton and the  $+$  H and  $\text{OH}^+$  can be prevented by a suitable treatment will there be a prospect of producing dyeings fast to light. (2) Pre-

venting or rendering difficult the reaction between the dyestuff and the perhydroxyl ions. It is possible that substances exist which would prevent reaction between the dyestuff and perhydroxyl ions, and between fiber and  $\text{OH}^+$  but no such expts. have been recorded. The facility of reaction between dyestuff and  $\text{OOH}^-$  may be decreased by converting the dyestuff into the least reactive state, *i. e.*, making it difficultly sol. This is the most common method, as illustrated by after-treatment with  $\text{CuSO}_4$ . The reaction between the dyestuff and perhydroxyl ions can also be prevented by directing the perhydroxyl ions into other channels. Small quantities of certain substances, *e. g.*, cerium sulfate or citrate of lime, are sufficient to eliminate continually the detrimental perhydroxyl oxygen atom. (3) Transformation of the dyestuff peroxides into more stable compds. If the formation of dyestuff peroxides cannot be prevented or if for other reasons none of the previous methods can be employed, use can be made of the important fact that dyestuff peroxides still possess the dyestuff character. Such dyestuffs may be used as from their constitution or on account of their combination with certain substances possess the property of splitting off the elements of water from the labile dyestuff, the "peroxyhydrates" thus changing with more stable dyestuff peroxides. When a dyestuff peroxide possesses dyestuff character there is the question whether it may not be possible to replace the peroxide oxygen in the dyestuff with some other radical which may make it more stable. The fiber under some circumstances may serve as such a radical. (4) Fastness to light is also increased by keeping back unfavorable influences of moisture.

L. A. OLNEY.

**Consolidating American dyestuff exports.** L. W. SCHMIDT. *Color Trade J.* 3, 385-7(1918).—It will be necessary for American dyestuff manufacturers to keep in close touch with Europe, for many foreign countries may be more readily reached through London, Lyons and Paris, than directly.

L. A. OLNEY.

**Progress in intermediates.** EDITORIAL. *Color Trade J.* 3, 388(1918).—More research and effort are required in the manuf. of intermediates than in the manuf. of the dyestuffs themselves. About 85% of money invested in dyestuff plant is absorbed in manuf. of intermediates. Great care must be taken as to their purity and freedom from other intermediates as this greatly influences the purity of the dyes produced from them. Chem. mfrs. must be prepd. to devote large sums of money to intensive and thorough research in the practical manuf. of these products. Since low cost often depends in the manuf. on large scale, it would be foolish for every dyestuff factory to manuf. all of its intermediates.

L. A. OLNEY.

**Safeguarding the dyestuff industry.** J. MERRITT MATHEWS. *Color Trade J.* 3, 381-4(1918).—Discussion of post war conditions of importance to dyestuff industry in which the following items are given prominence. The advantage of the import license system as operated in England, the necessity of a higher tariff, the advisability of cooperative control so as to evolve a unified plan of manuf. and development of research and technic are given.

L. A. OLNEY.

**Indigenous fibrous plants of Victoria.** J. W. AUDAS. *J. Dept. Agr. Victoria* 16, 600-9(1918).—A list is given of the flora well adapted to the manuf. of fibers occurring in Victoria, together with a description, location, and extent of occurrence of each variety. Cf. *C. A.* 12, 1804.

J. J. SKINNER.

WHITTAKER, C. M.: **Dyeing with Coal-Tar Dyestuffs.** London: Baillière, Tindall and Cox. 214 pp. 7s. 6d.

**Dyeing apparatus.** A. RUDLER. *U. S.* 1,282,633, Oct. 22.

**The production of dyes.** W. W. COE. Can. 187,675, Nov. 26, 1918. A dye containing extd. coloring matter of plant substances of the banana class is obtained by treating the banana fruit substance with a hydrolyzing agent in the presence of a compd. of one of the heavier metals.

**Azo dyes.** H. LEVINSTEIN. U. S. 1,283,231, Oct. 29. *p*-Aminoacetanilide 153 parts is diazotized and coupled in an alk. soln. with 200 parts of  $\beta$ -hydroxynaphthoic acid. The dye formed is sepd. by filtration and then hydrolyzed by heating to 90° with a 5% soln. of NaOH. Fast blue shades are produced by the dye when applied to chrome-mordanted wool with the addition of a little acid. Instead of *p*-aminoacetanilide, similar benzene derivs. containing halogen, alkoxy, sulfo or alkyl groups as substituents for H may be employed, yielding similar dyes.

**Azo dyes.** E. ANDERWERT, H. FRITZSCHE and H. SCHOBEL. U. S. 1,282,354, Oct. 22. Diazotized 4,2,1-nitroaminophenol, combined with *m*-aminobenzoyl-2,5,7-aminonaphtholsulfonic acid, produces a dye which dyes cotton dull roseate shades. Diazotized on the fiber with  $\beta$ -naphthol the tints become more yellowish. Diazotized nitroaminophenol when combined with the ureide of naphtholsulfonic acid,  $(\text{SO}_2\text{H}(\text{OH})\text{C}_6\text{H}_4\text{NH})_2\text{CO}$ , yields a dye which forms a violet soln. with  $\text{H}_2\text{O}$  and dyes cotton blue-violet shades which become clear chestnut-brown when developed on the fiber with *p*-nitrodiazobenzene. If *o*-aminophenolsulfonic acid be used as starting material instead of nitroaminophenol, in the last previously mentioned combination, a dye is obtained which produces scarlet-red on cotton. Diazoacylphenol derivs. may be used to produce similar dyes. The dyes thus formed are suitable for dyeing cotton, wool, silk, straw, wood, paper and mixed goods and also for the production of lakes.

**Azo dyes.** E. ANDERWERT, H. FRITZSCHE and H. SCHOBEL. U. S. 1,282,355, Oct. 22. Tetrazotized benzidine is combined with salicylic acid and the intermediate product thus formed, after acidulating with HCl until it shows a weakly acid reaction with Kongo, is combined with 2,5,7-aminonaphtholsulfonic acid, and then with the diazotized deriv. of *o*-aminosulfosalicylic acid. The trisazo dye thus formed dyes cotton brown. The dye obtained from benzidine, 2,5,7-aminonaphtholsulfonic acid and *o*-aminophenolsulfonic acid dyes cotton heliotrope tints. The trisazo dye from benzidine, 1,8,3,6-aminonaphtholdisulfonic acid, 1,8,2,4-aminonaphtholdisulfonic acid and 4,2,1-nitroaminophenol dyes cotton gray-blue tints. The following starting materials may also be used to produce similar dyes: tolidine, dianisidine, diaminostilbenedisulfonic acid, diaminodiphenyl ether, diaminodiphenylamine, aminobenzoyl-*m*-phenylenediamine, azoxyaniline, azoxytoluidine, aminodiphenylurea, diaminodiphenylthiourea.

**Azo dyes.** E. ANDERWERT, H. FRITZSCHE and H. SCHOBEL. U. S. 1,282,356, Oct. 22. Azo dyes suitable for use on cotton, wool, silk, mixed goods, straw, and other materials are produced by the combination of diazo derivs. of an *o*-aminophenol or *o*-aminonaphthol compd. with a second component capable of combining with two different diazo compds., e. g., 2,5,7-aminonaphtholsulfonic acid, 2,5,1,7- or 1,8,3,6- or 1,8,4,6-aminonaphtholdisulfonic acid, 1,8,5-aminonaphtholsulfonic acid, resorcinol, *m*-aminophenol, *m*-phenylenediamine, 2,7-dihydroxynaphthalene or an aminonaphthol and then combining this dye, as an intermediate product, with a tetrazotized deriv. of dianisidine, benzidine, tolidine, diaminostilbenedisulfonic acid, diaminodiphenyl ether, diaminodiphenylamine, aminobenzoyl-*m*-phenylenediamine, azoxyaniline, azoxytoluidine, diaminodiphenylurea or diaminodiphenylthiourea. The dye formed from *o*-aminophenol, dianisidine, and 1,4-naphtholsulfonic acid dyes unmordanted cotton dull blue. The dye from *o*-aminophenolsulfonic acid, benzidine and 2,5,7-aminonaphtholsulfonic acid dyes unmordanted cotton violet. Diazotized acylphenol derivs. also may be used as components in making similar dyes.

**After-chromable azo dye.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 77,803, June 1, 1918. In the manuf. of an after-chromable azo dye, the monoazo dye obtained by coupling 1-diazo-2-hydroxynaphthalene-4-sulfonic acid with 1-hydroxy-3-amino-4-methylbenzene in alk. soln., is further diazotized, and the resulting diazoazo compd. is coupled with resorcinol. The dye colors wool from acid bath in blue-black shades after-chroming to a fast green-black.

**After-chromable azo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 78,020, 78,021, 78,022, all of June 17, 1918. Addition to 77,803. (See *supra*.) The monoazo dye obtained by coupling nitro-1-diazo-2-hydroxynaphthalene-4-sulfonic acid with 1-hydroxy-3-amino-4-methylbenzene in alk. soln. is further diazotized, and the product coupled with resorcinol. The dye colors wool from acid bath in violet-black shades, after-chroming to a fast greenish black. The monoazo dye obtained by coupling 1-diazo-2-hydroxynaphthalene-4-sulfonic acid with 1-hydroxy-3-aminobenzene, in alk. soln., is further diazotized, and the resulting diazo compd. is coupled with resorcinol. The dye colors wool, in acid bath, in blue-black shades, after-chromable to a fast green-black. The monoazo dye obtained by coupling 1-diazo-2-hydroxynaphthalene-4-sulfonic acid with 1-hydroxy-3-aminobenzene, in alk. soln., is further diazotized, and the resulting diazo compd. is coupled with 1-hydroxy-3-aminobenzene. The product dyes wool, in acid bath, in black-violet shades, after-chromable to a fast greenish black.

**Acid dye containing chromium.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 77,662, May 16, 1918. The reactive azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\beta$ -naphthol, is treated with Cr oxide or its salts until the reaction is complete. The Cr is intimately combined, and does not ppt. from its aq. soln. by means of  $\text{Na}_2\text{CO}_3$ , NaOH, or  $\text{NH}_4\text{OH}$ . The product dyes animal fibers from acid bath in fast blue shades.

**Acid dyes with copper in fast combination.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 77,720-30, May 16, 1918. Addition to 76,560. The dyes obtained as specified below are treated with  $\text{CuSO}_4$  to obtain products from which the combined Cu is not pptd. from aq. soln. by  $\text{Na}_2\text{CO}_3$ , NaOH, or  $\text{NH}_4\text{OH}$ . The products are sol. in  $\text{H}_2\text{O}$  and dye animal fibers from acid bath as stated, the shades being fast to washing and light. Dark blue shades are produced by the Cu compd. of the azo dye from diazotized 4-chloro-2-amino-1-hydroxybenzene and benzylacetic-*o*-carboxylic acid. Brown-orange shades are produced by the Cu compd. of the azo dye from diazotized 4-nitro-2-amino-1-hydroxybenzene and 1-(2'-hydroxy-5'-sulfophenyl)-3-methyl-5-pyrazolone. Blue shades are obtained by the Cu compd. of the azo dye from diazotized 4-sulfo-2-amino-1-hydroxybenzene-6-carboxylic acid and benzolacetic-*o*-carboxylic acid. Reddish brown shades are produced by the Cu compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and diketohydrindene. Bordeaux shades are produced by the Cu compd. of the azo dye from diazotized 1-amino-2-naphthol-4-sulfonic acid and *peri*-naphthindandione. Red-violet shades are produced by the Cu compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and 3-hydroxy-1-thionaphthene. Violet-blue shades are produced by the Cu compd. of the azo dye from diazotized 1-amino-2-naphthol-4-sulfonic acid and 3-hydroxy-1-thionaphthene. Red shades are obtained from the Cu compd. of the azo dye from the diazotized 6-nitro-2-amino-1-hydroxy-4-methylbenzene and 1-(3'-sulfo-4'-hydroxyphenyl)-3-methyl-5-pyrazolone. Brown-orange shades are obtained from the Cu compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and 1-(2'-hydroxy-5'-nitrophenyl)-3-methyl-5-pyrazolone. Brown-orange shades, after-chromable, are produced by the Cu compd. of the azo dye from diazotized 4-nitro-2-amino-1-hydroxybenzene and 1-(4'-hydroxy-5'-carboxyphenyl)-3-methyl-5-pyrazolone.

**Acid dyes with copper in fast combination.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 77,731-6, June 1, 1918. Additions to 76,560. The azo dyes obtained as specified below are treated with  $\text{CuSO}_4$ , to obtain products from which the combined Cu is not pptd. from aq. soln. by  $\text{Na}_2\text{CO}_3$ , NaOH, or  $\text{NH}_4\text{OH}$ . The products are sol. in  $\text{H}_2\text{O}$  and dye animal fibers from acid bath in the shades noted, which are fast to washing and light. The azo dye obtained from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and 1-(4'-hydroxy-5'-carboxyphenyl)-3-methyl-5-pyrazolone yields upon treatment with  $\text{CuSO}_4$ , a dye giving garnet shades. Brick-red shades are obtained from the Cu compd. of the azo dye obtained from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and 7-hydroxy-4-methyl-1,2-benzopyrone. Wine-red shades are produced by the Cu compd. of the azo dye from diazotized 4-chloro-2-amino-1-hydroxybenzene-6-sulfonic acid and 7-hydroxy-4-methyl-1,2-benzopyrone. Brick-red shades are obtained from the Cu compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and 7-hydroxy-4-carboxy-1,2-benzopyrone. Brick-red shades are produced by the Cu compd. of the azo dye from diazotized 4-sulfo-2-amino-1-hydroxybenzene-6-carboxylic acid and 7-hydroxy-4-carboxy-1,2-benzopyrone. Yellow-brown shades are produced by the Cu compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and the condensation product of 1,6-dihydroxynaphthalene with phthalic acid.

**Acid dyes containing chromium.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 77,737-52, June 1, 1918. Addition to 77,248 (C. A. 12, 2133). In the manuf. of acid dyes contg. Cr in fast mol. combination, i. e., not pptd. from aq. soln. by  $\text{Na}_2\text{CO}_3$ , NaOH, or  $\text{NH}_4\text{OH}$ , the dyes specified below are treated, with heating, with alkali chromate solns. Animal fibers are dyed from acid soln. in the specified shades, fast to light and milling. Yellowish green shades are produced by the Cr compd. of the azo dye from diazotized 4-sulfo-2-amino-1-hydroxybenzene-6-carboxylic acid and benzoyl-acetic-o-carboxylic acid. Blue shades are produced by the Cr compd. of the azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\beta$ -naphthol. Blue shades are produced by the Cr compd. of the azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and  $\alpha$ -naphthol. Blue shades are produced by the Cr compd. of the azo dye from chloro-1-diazo-2-hydroxynaphthalene-4-sulfonic acid and  $\beta$ -naphthol. Blue shades are produced by the Cr compd. of the azo dye from chloro-1-diazo-2-hydroxynaphthalene-4-sulfonic acid and  $\alpha$ -naphthol. Blue shades are produced by the Cr compd. of the azo dye from bromo-1-diazo-2-hydroxynaphthalene-4-sulfonic acid and  $\beta$ -naphthol, or  $\alpha$ -naphthol. Violet-brown shades are produced by the Cr compd. of the azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and *peri*-naphthindandione. Bluish red shades are produced by the Cr compd. of the azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and 1-phenyl-3-methyl-5-pyrazolone. Red shades are produced by the Cr compd. of the azo dye from diazotized 1-amino-2-hydroxynaphthalene-4-sulfonic acid and 1-(3'-nitrophenyl)-3-methyl-5-pyrazolone. Violet shades are obtained with the Cr compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and  $\beta$ -naphthol. Violet shades are produced by the Cr compd. of the azo compd. from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid and 2-amino-5-hydroxynaphthalene-7-sulfonic acid. Reddish yellow shades are produced by the Cr compd. of the azo dye from diazotized 1-aminonaphthalene-4-sulfonic acid and salicylic acid. Red-violet shades are produced by the Cr compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid (3'-carboxy-4'-hydroxyphenyl)amide and  $\beta$ -naphthol. Red-violet shades are produced by the Cr compd. of the azo dye from diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid (3'-carboxyphenyl)amide and  $\beta$ -naphthol. Red shades are produced by the Cr compd. of the azo dye from diazotized 4-chloro-2-amino-1-hydroxybenzene-6-sulfonic acid and 1-phenyl-3-methyl-5-pyrazolone.



**Acid dyes with copper in fast combination.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 77,871-8, June 1, 1918. Addition to 76,560. The dyes obtained as specified below are treated with  $\text{CuSO}_4$  to obtain products from which the combined Cu is not pptd. from aq. soln. by  $\text{Na}_2\text{CO}_3$ ,  $\text{NaOH}$ , or  $\text{NH}_4\text{OH}$ . The products are sol. in  $\text{H}_2\text{O}$  and dye animal fibers from acid bath as stated, the shades being fast to washing and light. Brown-orange shades are produced by the Cu compd. of the hydrazone dye from 1 mol. of 1-hydroxy-2-hydrazinobenzene-4-sulfonic acid and 1 mol. dihydroxy tartaric acid. Brown-orange shades are produced by the Cu compd. of the hydrazone dye from 1 mol. phenylhydrazine, 1 mol. 1-hydroxy-2-hydrazinobenzene-4-sulfonic acid and 1 mol. dihydroxytartaric acid. Yellow-brown shades are obtained from the Cu compd. of the hydrazone dye from 2 mol. of 2-hydrazino-3-naphthol-6-sulfonic acid and 1 mol. of dihydroxytartaric acid. Cerise-red shades are obtained from the Cu compd. of the hydrazone dye from 1 mol. 1-hydroxy-2-hydrazinobenzene-4-sulfonic acid and 1 mol. 1,2,4-naphthoquinonesulfonic acid. After-chromable bordeaux-red shades are produced by the Cu compd. of the hydrazone dye from 1 mol. 1-hydroxy-2-hydrazinobenzene-4-sulfo-6-carboxylic acid and 1 mol. phenanthrenequinone. Deep gray shades are produced by the Cu compd. of the hydrazone dye from 1 mol. of 1-hydroxy-2-hydrazinobenzene-4-sulfonic acid and 1 mol. acenaphthenequinone. Red-brown shades are produced by the Cu compd. of the hydrazone dye from 2 mol. of 4-Cl-1-hydroxy-2-hydrazinobenzene and 1 mol. dihydroxytartaric acid. Dark brown shades are produced by the Cu compd. of the hydrazone dye from 1 mol. 1,2-naphthoquinone-4-sulfonic acid and 1 mol. 2-hydrazinobenzene-1-carboxylic acid.

**Disazo dyes.** A. E. GESSLER. U. S. 1,281,938, Oct. 15. Disazo dyes are produced by combining tetrazotized di-*p*-aminoditolyl with 2,6- or 2,7-naphtholsulfonic acid. The alkali metal salts and other metal salts of the dyes are insol. in  $\text{H}_2\text{O}$ , oils and usual org. solvents.

**Acid disazo dyes.** SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 78,180-78,205, July 1, 1918. Addition to 77,540 (C. A. 12, 2448). A series of disazo dyes is obtained by coupling the tetrazo compd. from 3,3'-diamino-4,4'-dimethyldiphenylmethane with 2 mols. of 1-hydroxynaphthalene-3-sulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-5-sulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-6-sulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-8-sulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-3,6-disulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-3,8-disulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-4,8-disulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-3,6-disulfonic acid, or with 1 mol. of 1-hydroxynaphthalene-4-sulfonic acid and 1 mol. of 2-hydroxynaphthalene-6-sulfonic acid, or with 1 mol. of 2-hydroxynaphthalene-3,6-disulfonic acid and 1 mol. of  $\beta$ -naphthol, or with 1 mol. of 1-sulfophenyl-3-methyl-5-pyrazolone and 1 mol. of 1-hydroxynaphthalene-4-sulfonic acid, or with 1 mol. of 1-sulfophenyl-3-methyl-5-pyrazolone and 1 mol. of 2-hydroxynaphthalene-6-sulfonic acid, or with 1 mol. of 2-hydroxynaphthalene-3,6-disulfonic acid and 1 mol. acetoacetanilide, or with 1 mol. of 2-hydroxynaphthalene-3,6-disulfonic acid and 1 mol. of barbituric acid, or with 1 mol. of 2-hydroxynaphthalene-3,6-disulfonic acid and 1 mol. of 1-hydroxy-4-methylbenzene, or with 1 mol. of 1-hydroxynaphthalene-4,8-disulfonic acid and 1 mol. of acetoacetanilide. Another series of dyes is obtained by coupling the tetrazo compd. from 3,3'-diaminodiphenylmethane with 2 mols. of 1-hydroxynaphthalene-3-sulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-4-sulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-5-sulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-6-sulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-8-sulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-3,6-disulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-3,8-disulfonic acid, or with 2 mols. of 1-hydroxynaphthalene-4,8-disulfonic acid, or with 2 mols. of 2-hydroxynaphthalene-3,6-disulfonic acid. All of these products dye

animal fibers from acid bath in fast shades, varying from scarlet-red to blue-red, red-orange, yellow-orange, pure red, yellow-red, orange, and orange-red.

**Mordanting leucotriphenylmethane azo dye.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 77,661, May 16, 1918. The diazo compd. of 4,4'-tetraethyldiamino-2'-amino-3'-hydroxytriphenylmethane-4'',6''-disulfonic acid is coupled with  $\beta$ -naphthol. The product is sol. in  $H_2O$  with a blue color, and in concd.  $H_2SO_4$  with a brown-violet color, and dyes wool from acid bath in greenish blue shades which are after-chromable to a fast greenish blue, or may be converted by treating with Cu salts to a pure fast blue.

**Mordanting azo dyes.** SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 78,013-20, June 17, 1918. Additions to 77,539 (C. A. 12, 2448). Dyeings on animal fiber, rendered fast by after-treatment with Cu salts, are obtained, as specified. They dissolve in  $H_2O$  and in concd.  $H_2SO_4$  with characteristic colors. Diazotized 4-sulfo-2-amino-1-hydroxybenzene-6-carboxylic acid, coupled with benzoylacetic-*o*-carboxylic acid, dyes animal fibers in brown shades, changing to blue upon after-treatment with Cu salts. Diazotized 4-nitro-2-amino-1-hydroxybenzene coupled with benzoylacetic-*o*-carboxylic acid yields brown dyeings converted to violet shades by treatment with Cu salts. Diazotized 6-nitro-2-amino-1-hydroxy-4-methylbenzene coupled with benzoylacetic-*o*-carboxylic acid yields olive-brown shades changing to blue upon treatment with Cu salts. Diazotized 4,6-dinitro-2-amino-1-hydroxybenzene, coupled with benzoylacetic-*o*-carboxylic acid yields brown shades changing to violet-blue upon treatment with Cu salts. Diazotized 1-amino-2-naphthol-4-sulfonic acid coupled with *peri*-naphthindandione yields violet-brown shades changing to bordeaux-red upon treatment with Cu salts. Diazotized 2-amino-1-hydroxybenzene-4-sulfonic acid coupled with *peri*-naphthindandione yields yellow-orange shades, which change to red-brown upon treatment with Cu salts. Diazotized nitro-1-amino-2-naphthol-4-sulfonic acid coupled with *peri*-naphthindandione yields brown shades, which change to red-brown upon treatment with Cu salts.

**Dyes from waste sulfite liquor.** J. PURING. U. S. 1,283,296, Oct. 29. 100 cc. of 30° Bé waste sulfite liquor is mixed with 10 g. of  $\alpha$ -naphthylamine and the latter is dissolved by gentle heating. The material is then cooled and 2-25 cc. strong  $HNO_3$  added. Intumescence results with production of a gray porous mass. A 1-2% soln. formed from this product dyes wool, silk or leather directly by mere immersion, removal, washing and drying. The shade produced depends upon the proportion of  $HNO_3$  used. With small amts. of  $HNO_3$ , the dye gives flesh-colored tints; with larger, bright yellows, and with intermediate proportions intermediate shades. In some instances additional  $HNO_3$  may be dissolved in the dye bath itself. Different results are obtained by adding the  $HNO_3$  in stages. E. g., if to a mixt. formed from the  $\alpha$ -naphthylamine and waste sulfite liquor, in the same quantities as above, there be added 2.5%  $HNO_3$  in successive small portions with const. stirring, a reddish brown  $H_2O$ -sol. compn. is obtained. This will dye flesh color. If 2.5% more  $HNO_3$  be added, the compn. assumes a violet color and will dye wool and silk brown from a neutral bath. On adding 5% more acid, a violent reaction takes place and the mass intumescs. On drying, this product forms a blue-black powder, dyeing silk and wool a yellow-brown. Using 20% of  $HNO_3$  in all, a brownish yellow powder is obtained which is more sol. than the product obtained with a total of 10% of acid and which dyes wool and silk bright yellow from a neutral bath. Various dyes of somewhat similar character may be also obtained by using, instead of  $\alpha$ -naphthylamine, phenol, cresols, aniline, benzene, toluene, or xylene. The colors produced on wool, hair, silk or leather are fast to soap,  $NH_4OH$ , soda and bleaching soda. Chromic acid and bleaching powder change some of the shades produced.

**Dyes mixed with soap.** C. C. HUFFMAN. U. S. 1,283,519, Nov. 5. In combining dyes with soap, a vegetable oil such as olive or corn oil is saponified with NaOH or KOH and a soln. of an aniline dye such as "acid red" is added when sapon. is only partially completed. The mixt. is agitated and molded at a temp. of about 50° and the reaction is permitted to continue to completion. The temp. of the mass, due to reaction, rises about 30° during the first 2 hrs. after being placed in the mold, and then, after gradually lowering to room temp. the material is slabbed and pressed into cake form.

**Substitute for sericin soap in dyeing silk.** P. SCHMID. U. S. 1,284,152, Nov. 5. A substitute for sericin soap in dyeing silk is obtained by boiling silk wastes containing silk-worm chrysalides with H<sub>2</sub>O to which has been added a small proportion of mineral acid, *e. g.*, 3% of H<sub>2</sub>SO<sub>4</sub>.

**Foam baths for treating textile materials.** P. SCHMID. U. S. 1,281,670, Oct. 15. The object of the invention is to provide foam baths without the use of soap, Na<sub>2</sub>CO<sub>3</sub>, silk chrysalides or silk wastes. Copse, chippings or sawdust of fir wood, pine wood or similar woods or the leaves of the beech, maple, poplar or acacia are placed in the bottom of the vessel in which the foam bath is to be prepd. and boiled with H<sub>2</sub>O. A small amt. of Na<sub>2</sub>CO<sub>3</sub> or soap may be added to the H<sub>2</sub>O. The heat kills any bacteria present and a foam is formed which rises into contact with textile materials which are placed in the upper part of the vessel. The method may be employed in ungumming, phosphating, silicating, cleaning, fulling, dyeing or mordanting. Fibers of animal, vegetable or chemical origin may be treated. The material treated may be supported in any suitable manner to allow it to come into contact with the foam but not with the solids and liquid from which the foam is produced and before the foam treatment the material may be satd. with Na<sub>2</sub>CO<sub>3</sub> soln.

**Woven fabrics.** K. MIYAKE. Brit. 119,428, June 7, 1918. The leaves of the coconut palm are rendered suitable for weaving into cloth, hats, mats, slippers, bags, etc., by boiling in H<sub>2</sub>O, splitting, and tearing into strips, which are boiled for 1 to 2 hrs. in a soln. of 4-8 lbs. of Na<sub>2</sub>CO<sub>3</sub> in 100 lbs. of H<sub>2</sub>O. The strips are then washed and placed for 1 to 3 days in a bleaching soln. comprizing 100 lbs. of H<sub>2</sub>O, 1-3 lbs. of Na<sub>2</sub>O<sub>2</sub>, 1-2 lbs. K<sub>2</sub>C<sub>2</sub>O<sub>4</sub>, and 50-100 g. of H<sub>2</sub>SO<sub>4</sub>, the material preferably being disturbed from time to time. The strips are then washed and dried in the shade while exposed to an air current, and when dried roll up from both sides and become smooth and semi-transparent. The finished threads are strong, light, elastic, waterproof, and of a good feel.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**Waterproofing composition.** W. RODENBERGER. U. S. 1,283,913, Nov. 5. A mixt. for coating and waterproofing leather, textile fabrics or other materials is formed of white lead, linseed oil, coal tar, paraffin, turpentine, corn starch, poppy oil and a coloring material such as a lead pigment.

**Lacquering.** SOC. ANON. L'HELICE INTEGRALE ANCIENS ETABLISSEMENTS L. CHAUVIERRE. Brit. 118,610, July 23, 1918. Lacquered articles are placed in an app. provided with means for regulating the temp. and humidity of the air. Ozone, etc., may be introduced, and the elec. tension may be regulated. The articles are protected by screens from ultraviolet rays.

**Hardening varnish.** C. A. CUTLER. U. S. 1,283,685, Nov. 5. Varnished articles are treated, to harden the varnish, by placing them within a closed chamber having a permeable wall on one side, heating the air within the chamber at the side opposite

to the permeable wall to a temp. higher than that of the external air, the air as it rises being cooled by contact with the wall of the chamber and a portion of the air thus cooled being forced out through the permeable wall near the top of the chamber to the external air and some of the external air being drawn into the chamber through the lower portion of the permeable wall.

**Varnishing balloons.** H. E. HONEYWELL. U. S. 1,281,374, Oct. 15. Balloon cloth is sized in a mixt. formed of PbO 8 oz., ocher 8 oz. and linseed oil 1 gal., passed between rolls to remove excess sizing, dried, and after making up into balloons is rendered tacky by a coating of varnish and then coated with a mixt. of Al powder 1 and French chalk 2 parts.

**Oxidizing and polymerizing vegetable oils.** J. K. BLOGG. U. S. 1,284,572, Nov. 12. Vegetable oil to be oxidized and polymerized, *e. g.*, linseed oil for use in printers' varnish, is rapidly heated in a closed retort over an open fire and a current of air is passed through the oil by suction applied to the upper portion of the retort. When the temp. approaches the flash point of the oil, the supply of air is discontinued.

**Writing-ink.** M. SHINOZAKI. U. S. 1,282,302, Oct. 22. A writing-ink is formed of a soln. of caustic alkali, induline or other dye, lampblack and soft soap. The lampblack is retained in suspension.

**Printers' ink.** L. E. BARTON and H. A. GARDNER. U. S. 1,283,455, Nov. 5. Titanic oxide which may be coalesced with sulfate particles is added to printers' inks or colors of usual character otherwise, for the purpose of improving their opacity, smoothness and durability.

**Phenol-methylene condensation products.** REDMANOL CHEMICAL PRODUCTS CO. Brit. 119,252, July 25, 1917. A fusible anhydrous resinous condensation product is obtained by mixing together an excess of a phenol, a methyleneamine compd. such as hexamethylenetetramine, and a small proportion of coal-tar creosote oil, and heating to effect condensation. A proportion of a methylene compd. sufficient to form eventually an infusible product may then be added, and the mixt. cooled, comminuted, mixed with a filler, rolled between differential rollers to cause a certain amt. of reaction, and finally pulverized. The product so obtained can be converted into the final insol. substance by heating in molds. The initial fusible resin may be dissolved in solvents to give a varnish which may be mixed with hexamethylenetetramine to render it capable of hardening on being heated. Cf. 9,291, 1914 (*C. A.* 9, 2715).

**Phenol-methylene condensation products.** REDMANOL CHEMICAL PRODUCTS CO. Brit. 119,253, July 25, 1917. The process of producing a fusible anhydrous resinous condensation product described in 119,252 (see *supra*) is modified by using a large excess of phenolic compd. at the outset, condensing it with the methyleneamine compd. by heat, then blowing off a portion of the free phenol from the product and adding the coal-tar creosote oil. The product is subsequently mixed with a further amt. of methyleneamine compd. and fillers worked up as described in the aforesaid specification.

**Non-conducting coverings.** F. H. ADDIS. Brit. 119,134, Oct. 29, 1917. A non-conducting covering for the roofs of railway carriages or like vehicles in hot climates consists of a compn. containing ground cork, woody fiber, oxidized oil (preferably linseed), and mineral matter, such as kieselguhr, chalk, or baryta, applied to a fibrous backing, such as canvas. Suitable proportions for the compn. are 75% of ground cork or woody fiber, 16% of oxidized oil, and 9% of mineral matter. Cf. 7,354, 1890, and 267, 1902.

**Resin.** F. W. SPERR, JR. and M. DARRIN. Can. 184,890, June 11, 1918. Crude solvent naphtha is subjected to heat and pressure in the presence of a catalytic agent.

27. **FATS, FATTY OILS AND SOAPS.**

E. SCHERUBEL.

The French soap and oil industry. ANON. *Chem. Trade J.* 63, 361-2(1918).

E. H.

The cottonseed industry of India. ANON. *Agr. J. India* 13, 549, 1(1918).—Several Indian cotton seeds give an average of 19.67% oil, 34.68% meal and 45.65% husk.

J. J. SKINNER.

Rapid changes in palm oil. BALLAND. *Compt. rend.* 167, 673-4(1918).—Three samples representing lots procured during Jan., Feb. and March, 1917, were analyzed May 25, with the following results:

|                         | 1.    | 2.    | 3.    |
|-------------------------|-------|-------|-------|
| Fatty substances.....   | 96.0% | 98.7% | 99.0% |
| Impurities.....         | 4.0   | 1.3   | 1.0   |
| Free acid as oleic..... | 61.2  | 19.4  | 8.3   |

The oils were rancid and the free acid continued to increase to over 75%. The oils were intended for consumption by colonial troops, but for this purpose the free acid should not exceed 1%. Palm oils appear to undergo a spontaneous sapon. which unfits them for edible purposes after some months.

E. SCHERUBEL.

New method for the exact determination of the fatty acid content of soaps. E. BOSSEHARD AND F. COMTE. *Helvetica Chimica Acta* 1, 251-70(1918).—From 4 to 6 g. of soap are dissolved in hot H<sub>2</sub>O and transferred to the "sapometer" of Huggenberg and Stadlinger, which contains 25 to 30 cc. of N H<sub>2</sub>SO<sub>4</sub> and a few drops of methyl orange. Water is added to the 100 mark, and after cooling, 50 cc. of a mixt. of equal parts of ether and petroleum ether. After shaking, 50 cc. more of the ether mixt. are added and after sepn. into layers, the acid layer is drawn off, the ether layer washed with 100 cc. H<sub>2</sub>O, and the vol. read. Next 25 cc. are drawn off into a weighed Erlenmeyer flask contg. a known wt. (about 5 g.) of PbO and a few pieces of pumice. After shaking, the solvent is evapd. and the flask evacuated by means of a water pump. The flask is next dried for 20 min. at 60° in a Victor Meyer crucible drying oven under reduced pressure. The increase in wt. of the flask is due to the fatty acid anhydrides which have combined with the PbO. This method has been thoroughly tested on pure fatty acids, mixts. of fatty acids and various soaps, including rosin soaps, and has been found to give accurate results.

E. SCHERUBEL.

Clarifying oils. A. G. MUNRO. U. S. 1,284,750, Nov. 12. After refining cottonseed or similar oils with fuller's earth, the oil is sepd. from the latter by successive treatment with air, H<sub>2</sub>O and steam. The pat. describes app. for carrying out the method.

High-melting point fatty acids and other products from wool-fat or similar substances. I. LIRSCHÜTZ. U. S. 1,284,723, Nov. 12. Wool-fat is saponified or hydrolyzed, washed with alc. at ordinary temp. until a wax-like residue remains and the latter is then treated with a suitable solvent such as ether or CS<sub>2</sub> to ext. the unsaponifiable portion and obtain as a residue soaps of fatty acids of high m. p. The soln. obtained from the wax-like product is allowed to crystallize to obtain the unsaponifiable H<sub>2</sub>O-miscible substances from it. A soft unsaponifiable mass is obtained which is sol. in ether, C chlorides and CS<sub>2</sub> and in acetone, of a light yellowish color, very miscible with H<sub>2</sub>O and m. 45-50°. This substance is adapted for use in ointments.

Hydrogenating liquids catalytically. R. F. STEWARD. U. S. 1,284,488, Nov. 12. Cottonseed oil or other liquid to be hydrogenated is spread in film form upon a

rapidly rotating surface, by centrifugal action, and while thus spread is subjected to the action of H and a catalyst.

**Apparatus for extracting grease or oils with solvents.** W. E. GARRIGUES. U. S. 1,282,407, Oct. 22. The app. comprizes a horizontal rotary extn. drum with pipe connections for leading hot gases into the lower portion of the drum.

**Catalyst.** A. SCHWARCMAN. U. S. 1,292,296, Oct. 22. A catalyst suitable for use in hydrogenating oils or fats is formed of finely ground roasted quartz and fuller's earth carrying finely divided colloidal Ni. U. S. 1,282,297 describes the production of a catalyst for use in hydrogenating oils, formed of finely divided native amorphous  $\text{SiO}_2$ , free from pores and of the character occurring in asbestos deposits, of a fineness of 400 mesh or greater and carrying reduced Ni. Cf. C. A. 12, 2700.

**Fatty acids from used soap baths.** R. CLAVEL. Swiss 78,280, July 1, 1918. Soap-decomposing agents are used which do not contain S, in order that a mechanical mixt. merely of fatty acid,  $\text{H}_2\text{O}$ , and impurities is produced, and not a permanent emulsion.

**Fatty acids from used soap baths.** R. CLAVEL. Swiss 78,281, July 1, 1918. Soap color baths containing albumin, *e. g.*, used soap baths, are used to sep. the fatty acid, in conjunction with baths containing tannin.

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## 28. SUGAR, STARCH AND GUMS.

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A. HUGH BRYAN.

**Boiling-house recovery.** G. H. HALDÉN. *Intern. Sugar J.* 20, 467-74(1918).—A thorough investigation of the various sources of loss which cause the actual boiling-house recovery to differ from the theoretical. A. GROSS.

**Measuring the color of sugar products.** F. W. ZERBAN. *Louisiana Planter* 61, 282-3(1918).—Some difficulty was encountered in making accurate comparative tests of the decolorizing effect of vegetable carbon. The Hess-Ives Tint-Photometer was used and proved of great usefulness. A. GROSS.

**New tables for finding purity of massecuite.** NORBERT CLAIBORNE. *Sugar* 20, 454-5(1918). A. GROSS.

**Refining of raw sugars.** C. G. LEONIS. *Sugar* 20, 394-7, 440-1(1918).—A complete discussion of the subject from the wash plant house to the finished product is given. The various calcns. used and the methods of operation are described in detail. Many data are inserted which have proved useful from an operating standpoint. A. GROSS.

**Beet sugar factories.** FRANK COXON. *Intern. Sugar J.* 20, 456-9(1918).—Some points of interest in station equipment are described. A. GROSS.

**Nitrogen in French sugar beets.** E. SAILLARD. *Sugar* 20, 451-2(1918).—Analyses of beets are given and comments are made upon the loss of the N. A. GROSS.

**Complete electrification of sugar mills.** C. G. HADLEY. *Elec. World* 72, 1022-3(1918).—Description of the satisfactory results in elec. equipment obtained at the New Cuban Mills. C. G. F.

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**The Abbé and Pulfrich refractometers (ANON.)** 1. Industrial preparation of lactic acid from sugar beets (BONELLI, GULINELLI) 10.

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**Dextrin.** W. W. McLAURIN. U. S. 1,283,839. Nov. 5. Concd. dextrin in soln. or liquid form is made by placing substantially equal quantities of commercially

pure starch and  $H_2O$ , together with less than 1% of acid such as  $HCl$ , in a closed vessel, heating indirectly by steam to a temp. of about  $137^\circ$  while producing a corresponding high pressure on the materials and maintaining this pressure and continuing the treatment until substantially complete conversion has been effected and a colorless soln. of dextrin, liquid at a temp. of  $15-20^\circ$ , is obtained.

**Dextrin.** W. W. McLaurin. U. S. 1,284,120, Nov. 5. A normally hydrolyzed, substantially clear dextrin soln. or liquid having a concn. of about 50% and suitable for use without further treatment as a coating, adhesive, or for the impregnation of paper, wood or other materials, is made from starch, *e. g.*, by the method described in U. S. pat. 1,283,839 (*supra*).

**Stiffening substance for laundry.** O. LOBECK. Swiss 77,911, June 1, 1918. A substitute for starch contains powdered hydrophile colloids such as glue, gelatin, gum arabic, agar-agar, dextrin, casein, albumin, or tragacanth, alone or mixed. The product is instantly sol. in hot  $H_2O$ . A drying agent may be added, such as borates, Mg salts, Ca salts.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

Mr. Small's modification of the hydrochloric acid-formaldehyde method for separating tannins, with special application to chestnut oak bark and chestnut wood. Committee report. T. G. GREAVES. *J. Am. Leather Chem. Assoc.* 13, 388-95 (1918). —The object of the committee work was to find out what agreement could be expected between different laboratories using Small's  $HCl-CH_2O$  method (*C. A.* 5, 2346) for the quantitative detn. of pyrogallol tannins, especially chestnut wood ext., in admixture with chestnut oak bark ext. The instructions sent out are given and they involve only a slight change of the original method so as to bring the drying into the limits of the working day. Two samples of pure chestnut oak bark ext. and 2 of chestnut wood ext. together with 1 sample each of chestnut oak bark and chestnut wood were sent to each of the 10 operators. The av. ppt. weights obtained are given. The results are also calcd. to % of ext. for which purpose the typical ppt. weights of chestnut oak bark and chestnut exts. were taken as 0.1600 and 0.0150, respectively. The formula for this calcn. is given. The final av. ppt. weights obtained for the 2 chestnut oak bark exts. were 0.1572 and 0.1798, corresponding to 2% chestnut ext. and 98% chestnut oak bark ext. for one and —14% chestnut ext. and 114% chestnut oak bark ext. for the other. The figures for the chestnut wood exts. were 0.0273 and 0.0228, indicating 92 and 95% chestnut wood ext. The av. results on the chestnut oak bark were 0.1845 and for the chestnut wood 0.0132. Some idea of the variation between duplicate detns. is given in a table showing the highest and lowest ppt. wt. obtained by each operator on the 4 exts. The results show that the method, being based on the figure obtained for the ppt. wt. which is not the same for all samples, cannot be classed as an exact method. It is useful, however, in detecting accidental mixing or wilful adulteration.

R. W. FREY.

**Leather substitutes.** J. WARD. Brit. 119,304, Oct. 16, 1917. A substitute for leather consists of coarse felt impregnated and covered with a mixt. of leather powder, vulcanized rubber powder, and free S heated to a semi-liquid state, with which may be incorporated resin,  $Na_2SiO_3$ , and coloring matter. Leather scrap or waste is roasted in a hot-air kiln until it is crisp and is then ground into a powder. Eight parts by wt. of the powder are mixed with 2 parts of vulcanized rubber which has previously

been worked into a fine powder in a cold-chamber grinding mill, the mixt. being rendered more solid if desired by the addition of one part each of resin and  $\text{Na}_2\text{SiO}_3$ . One part of S is added, and a coloring ingredient also if a colored product is required. After mixt. and heating, the material is forced in a semi-liquid condition into the open pores and coated on the surface of coarse felt and cooled until solid.

**Liquid mixture for waterproofing felt.** F. PICARD. U. S. 1,281,650, Oct. 15. A liquid mixt. for treating felt to produce a *substitute for leather* is formed of linseed oil 5 lbs., rosin 5 lbs., gutta percha 5 lbs., gum arabic 5 lbs., shellac 80 lbs. and gasoline or alc. 40 gals.

**Tanning.** R. BOHN, O. BALLY and H. WOLFF. U. S. 1,281,494, Oct. 15. De-limed hides are tanned by treatment with a bath containing an anthracenesulfonic acid, *e. g.*, a soln. formed from  $\text{H}_2\text{O}$ , a small amt. of  $\text{H}_2\text{SO}_4$  and alkali metal salts of 1,5- and 1,8-anthracenedisulfonic acids, dichloroanthracenedisulfonic acids or phen-anthrene- or fluorenesulfonic acids.

**Tanning agent.** CHEM. FABRIKEN WORMS AKT.-GES. Swiss 78,282, July 1, 1918. A tanning agent is obtained by sulfonating tar oil and treating it with  $\text{HCHO}$ . The product tans animal gluc, is sol. in  $\text{H}_2\text{O}$ , and exhibits the properties of ordinary tannins. The dry substance carbonizes upon heating, without previous fusion. The product is sol. in  $\text{H}_2\text{O}$  as well as in dil. acids and alkalies, but insol. in org. solvents which are not miscible with  $\text{H}_2\text{O}$ .

**Tanning with aluminium salts.** O. RÖHM. Swiss 77,935, June 1, 1918. Al formate or acetate is used, or the usual alum tanning process is followed by treatment with wash  $\text{H}_2\text{O}$  containing the formate or acetate of an alkali or alk.-earth metal, *e. g.*, Ca formate or acetate.

**Gelatin.** T. TADA. Brit. 119,210, June 3, 1918. See Jap. 32,303 (C. A. 12, 2259).



# CHEMICAL ABSTRACTS

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No. 3

## I. APPARATUS.

L. C. JONES.

**Absorption pipets.** E. VAN ALSTINE. *J. Ind. Eng. Chem.* 11, 51-2(1919), illus.—The app. has been designed with the purpose of accomplishing complete and rapid absorption of gases without the use of glass beads or rods. E. J. C.

**New reflux condenser.** JAMES J. BAJDA. *J. Ind. Eng. Chem.* 11, 52(1919), illus. E. J. C.

**A simple and efficient condenser.** R. HOWDEN. *Chem. News* 117, 368(1918).—A condensing arrangement is described and illustrated which can readily be constructed from ordinary lab. materials. It has proved very efficient in the distn. of ether residues. E. J. C.

**Device for rapid cleaning of pycnometers.** M. DUGARDIN. *Ann. chim. anal.* 23, 125-6(1918).—The device consists of a right-angled glass tube, the longer leg of which is drawn out to a length somewhat greater than the height of the app. and to a diam. sufficiently small to slide into the neck of the app. without binding. The other end of the tube is inserted into the neck of a 1-l. flask fitted with a tight 2-hole stopper; through the 2nd hole another tube connects with a vacuum pump. A 3rd tube, one end of which is drawn out to a very small diam., the other end being connected to a water tap by means of a rubber tube closed by a Mohr pinch-cock, is fastened to the vertical leg of the 1st tube by means of rubber bands. In operating, the pycnometer, full of the liquid to be evacuated, is raised sufficiently to allow the tube to reach to the bottom, and at the same time the pump is started. When all the liquid has passed into the flask, the pycnometer is again lowered until the mouth of the tube is in the narrowest part of the neck. The pinch-cock is then released and water allowed to run into the app. The partial vacuum causes the water to be forced over every part of the inner surface, insuring a thorough cleaning. When the app. is full of water, the pinch-cock is closed and the operation repeated from the beginning as many times as necessary. J. L. WILEY.

**Telescopic focusing apparatus for photomicrography.** A. F. HALLIMOND. *Engineering* 106, 448(1918).—A brief description of the apparatus with accompanying diagram. S. G. SIMPSON.

**Helps on proper maintenance of pyrometers.** A. GEMMELL. *Elec. Rev.* 73, 980-1(1918).—Illustrated account of a number of practical methods for the care and protection of pyrometer ends and leads. One diagram shows an arrangement of protecting pipes and fire ends in a retort; another, a simple method of swinging connecting wires out of the way when opening the retort. C. G. F.

**Electrical welding apparatus.** ANON. *Elec. Rev.* 73, 984-6(1918).—A review. C. G. F.

**Modern packings for absorption towers. Coke acid filters.** A. HUTIN. *Rev. prod. chim.* 21, 169-70(1918).—To obtain the max. absorption of a gas in a liquid, two conditions must be satisfied. First, there must be max. surface exposure of the liquid to the gas; second, there must be uniform distribution of the fluids in the ab-

sorption app. so that the so-called "rat-holes" are not formed. A mathematical formula is derived by H. to show that the surface of exposure of a packing, made in the form of a cylinder with height equal to diameter, varies inversely as the diameter. It is calcd. that the max. surface is obtained by the use of 3 concentric cylinders. A cheap and efficient packing may be made from bottles, cut in half, with the top half placed neck down in the bottom half. Gas coke is not suitable for use as a packing in coke filters, because the coke contains  $\text{Al}_2(\text{SO}_4)_3 \cdot 27\text{H}_2\text{O}$  and  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  which clog the pores of the coke and form dil. solns., contaminating the acid. Metallurgical coke is best. Materials, having high porosity, are desirable. An efficient packing can be made from kieselguhr as a base. One-fourth of the vol. of this packing is solid matter. For use in acid filters a packing was made in the laboratory as follows: Glass was ground to 30 mesh. 99% of this powder was mixed with 0.5% finely pulverized caking coal and 0.5% powdered asphalt. The mixt. was quickly heated in a muffle. Due to the rapid evolution of a large amount of gas, the mass swells up and becomes so porous that when the operation is carried out properly the product will float on water. A practical test of this packing was not made, but the advantages of its use are evident as (1) its larger contact surface, (2) its resistance to acids and vapors, (3) its cheapness.

ISMAR GINSBERG.

**Mixing-drums for dry material.** E. A. KÜPPERS. *Chem. App.* 5, 65-67(1918).—Description and working directions are given for mixing-drums in general and of the Mühlau, Häberle, Prosper types in particular. Nine sketches are included.

TH. VERHEGGEN.

**Carrying away of masses of boiling liquids in evaporating apparatus. A monograph on scum-separators, their construction, working and action.** HUGO SCHRÖDER. *Chem. App.* 4, 97-99, 105-8, 113-6, 121-2, 129-32, 137-9, 146-9, 156-8, 164-6, 171-2, 180-2, 185-7(1917); 5, 4-6, 9-11, 19-22, 33-4, 41-5, 51-3, 57-60(1918).—In evapg. app. the masses of vapors carry away greater or less quantities of liquid, partly in form of drops, partly in the state of scum, or a mixt. of both. This fact is often the source of important losses which are to be avoided, either for the sake of the residue or to obtain a condensate free from the original admixture. The author describes the different scum-separators. Eighty-six sketches are included. TH. VERHEGGEN.

**History of the gasometer.** FRANZ M. FELDHAUS. *Z. angew. Chem.* 37, I, 164 (1918).

TH. VERHEGGEN.

**Acetylene generator.** W. H. ROWE. U. S. 1,285,799, Nov. 26.

**Gas-absorption apparatus for determinations of carbon dioxide.** A. BUTCHER. U. S. 1,285,927, Nov. 26.

**Apparatus for making, storing or transporting corrosive chemicals.** I. WOLF. U. S. 1,285,537, Nov. 19. The app. comprizes a frame within which is supported a screen of expanded metal work carrying mineral "base material" with a lining of acid-proof material such as Pb. The app. is especially adapted for tank walls or stirrer.

**Hollow ware of tungsten or other refractory materials.** C. A. PFANSTIEHL. U. S. 1,286,089, Nov. 26. Hollow ware, such as dishes for lab. work, are formed of powdered W, Ta, MgO or oxides of W, Ta or Th by inserting a body of Cu into a mass of the powder, compressing the powder around the Cu under a pressure of 130-160 tons per sq. in. (at which pressure the Cu flows and becomes to a certain extent embedded in the compacted refractory material) and the embedded Cu may then be removed by the action of  $\text{HNO}_3$  or other solvent selected with reference to the refractory material employed so as not to attack the latter.

**Retorts.** JNO. WEST and WM. WILD. Can. 187,765, Dec. 3, 1918. A series of

retorts has in combination with it combustion chambers at the inlet end of the retorts, secondary air-heating chambers at the outlet-end of the retorts and waste-gas circulating chambers between the said combustion and air-heating chambers.

**Water-cooled buckstay.** G. L. DANFORTH, JR. *Can.* 187,816, Dec. 3, 1918. A buckstay of a rolled metal slab has a drilled aperture therethrough and water connections to the aperture comprising a pipe extending downwardly within the aperture.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

**Science and the future.** A. A. CAMPBELL SWINTON. *J. Roy. Soc. Arts* 67, 7-19 (1918); *Electrician* 81, 663-4 (1918).—"There is one method of acquiring a scientific education to which not nearly enough attention is paid, the private reading of technical books and of periodic scientific literature." The most important problem of the future is one of photochemistry: to find the best means of utilizing the "enormous flood of solar radiant energy." C. G. F.

**Chemical nomenclature.** E. J. CRANE. *J. Ind. Eng. Chem.* 11, 72-3 (1919).—The discussion is accompanied by the statement of a few preferences concerning which it is thought that there will be no disagreement and which represent not so much C.'s opinion as the "accumulated experience from the constant effort which has been made in the office of *Chemical Abstracts* to keep the abstract journal an example of good nomenclature." Greater exactness in our chemical records is the object that has been held in mind. E. H.

**National prestige in scientific achievement.** P. G. NUTTING. *Science* 48, 605-8 (1918). E. J. C.

**The criteria in the declaration of chemical independence in the United States.** I. NEWTON KUGELMASS. *Science* 48, 608-12 (1918).—An address. E. J. C.

**The two hundred and fiftieth anniversary of chemical industry in America.** C. A. BROWNE. *J. Ind. Eng. Chem.* 11, 16-9 (1919).—The first origins of chemistry in America are discussed. John Winthrop (1606-1676), a biography of whom is given, deserves the honor of being called the first American chemist in point of time. E. J. C.

**British university resources compared with those of the United States.** Education Committee, Brit. Science Guild. *Elec. Rev.* 73, 1010 (1918).—In proportion to population the U. S. has twice as many students of University standard as England; Scotland has more than three times as many and Germany has nearly three times as many. There are only 5,000 full-time students of science and technology in the United Kingdom in comparison with nearly 17,000 in Germany and 34,000 in U. S. Other details are given. C. G. F.

**Prof. Dr. Ed. Mulder.** W. P. JORISSEN. *Chem. Weekblad* 15, 1503-16 (1918).—This biographical sketch is accompanied by a bibliography of Dr. Mulder's contributions to chemistry. E. J. C.

**Ernst Cohen.** W. P. JORISSEN. *Chem. Weekblad* 15, 1404-17 (1918).—Biographical with photograph. E. J. C.

**Bibliography of the publications of Ernst Cohen.** H. R. KRUYT. *Chem. Weekblad* 15, 1432-70 (1918).—Eight books and 225 papers have been contributed. E. J. C.

**The piezochemical investigations of Prof. Dr. Ernst Cohen.** A. L. TH. MOERSVELD. *Chem. Weekblad* 15, 1438-51 (1918). E. J. C.

**The electrochemical investigations of Prof. Dr. E. Cohen.** W. D. HELDERMAN. *Chem. Weekblad* 15, 1426-37 (1918). E. J. C.

**Investigations on allotropy by Prof. Dr. E. Cohen.** TH. STRENGERS. *Chem. Weekblad* 15, 1418-25(1918). E. J. C.

**Report of the chemist.** CARL L. ALSBERG. Chief of Bur. of Chemistry, U. S. Dept. of Agr. *Annual Repts. Dept. Agr.* 1918, 24 pp.—The work of the year ending June 30, 1918 is outlined. Investigations suitable to be abstracted have been or will be abstracted as they appear as separate publications. E. J. C.

**Annual report of the Director of the Bureau of Standards to the Secretary of Commerce for the fiscal year ending June 30, 1918.** 206 pp.(1918).—Abstracts have been or will be published of the individual investigations as reported in separate publications. E. J. C.

**Eighth annual report of the Director of the Bureau of Mines.** VAN H. MANNING, Director. 124 pp. (1918).—The rept. is for the fiscal year ended June 30, 1918. A large part of the activities were in connection with war work. Abstracts have already been published or will be published later as the reports of the various individual investigations appear. E. J. C.

**Modification of the periodic table.** INGO W. D. HACKH. *Am. J. Sci.* 46, 481-501(1918).—From the curves obtained by plotting the relative electromotive forces of the elements and their max. polar numbers against their atomic numbers, it can be predicted that no new rare gas can be discovered. Such a gas would demand characteristic properties of about 13 other elements and of these 13 elements none is known. The periodic system is best expressed in a continuous curve, *e. g.*, a spiral; but as such graphic representations are difficult, a table has been derived which in H's. opinion shows the relationship among the elements better than the customary table. D. MACRAE.

**Experimental researches on the thermal conductivity of gases. I and II.** S. WEBER. *Ann. Physik* 54, 325-6, 437-62(1918); *Sci. Abstracts* 21A, 268.—The principle feature of Part I is the investigation of convection effects and their elimination. Results for dry air free from CO<sub>2</sub> are given. Part II contains data for H, He, Ar, N, O, CH<sub>4</sub>, CO<sub>2</sub>, and "nitrous dioxide," and methods for prepg. the pure gases and tables of results for the thermal cond. The dependence of thermal cond. on temp. is dealt with at some length. The results obtained show a special behavior of H; at higher temps. this gas is diatomic, but at temps. near that of liquid air it gives the monatomic curve, which at the lowest point lies almost on the A curve. The course of the curve is in consonance with the loss by H of internal energy at lower temp. In the group of diatomic substances, O, N, and CO behave similarly, the curves being parallel to the A and He curves. At lower temps. the curves for O and N appear to approach the A curve. D. MACRAE.

**Theoretical and experimental researches on the thermal conductivity of gas mixtures. III.** S. WEBER. *Ann. Physik* 54, 481-502(1918); through *Sci. Abstracts* 21A, 268-9(1918); cf. preceding abstract.—On account of the great importance of the halfwatt lamp in lighting technology, the thermal conds. of gas mixts. have acquired enhanced interest. Knudsen's method is employed for deriving a formula which shall represent the thermal cond. of a gas mixt. This formula is then discussed in its application to common gas mixts., *e. g.*, N and O, O and H, A and He, H and CO<sub>2</sub>. None of these usual gas mixts. gives a max. or minimum value of the thermal cond. when the theoretical values of the constants are used in the formula. Air, O-H mixts., and H-CO<sub>2</sub> mixts. are more rigidly examd. The discussions of some measurements of the thermal cond. at 0° of mixts. of N and A conclude the paper. D. MACRAE.

**Specific heats of lead-antimony alloys.** R. DURRER. *Physik. Z.* 19, 86-8(1918); *Sci. Abstracts* 21A, 269(1918).—The sp. heats of Pb-Sb alloys at const. temp. are a

linear function of the concn. within the temp. range of  $20^{\circ}$  to  $100^{\circ}$ . The method of Levin and Schottky was employed.

D. MACRAE.

**The electrical conductivity of acids and bases in aqueous solutions.** JNANENDRA CHANDRA GHOSH. *J. Chem. Soc.* 113, 790-9(1918).—This is an attempt to explain the abnormally high mobility of the  $H^+$  and  $OH^-$  in aq. solns. It is assumed that the observed cond. of  $H^+$  or of  $OH^-$  in  $H_2O$  is the additive effect of two processes, namely, (1) the transfer of electricity by the convection of charged bodies, and (2) the transference of the elec. charge through mols. of  $H_2O$  by the alternate process of dissociation and recombination during impact with  $H^+$  or  $OH^-$ . In the latter process  $H^+$ , for example, dissociates a  $H_2O$  mol. by impact and then combines the  $OH^-$ , while the H atom of the  $H_2O$  mol. which is farthest from the point of impact shoots off as a charged particle. Thus at each impact attended with dissociation, there is saved a distance proportional to the diameter of the  $H_2O$  mol. with the result that the  $H^+$  appears to have a velocity greater than its true velocity. Quant. application of this hypothesis permits the calcn. of  $\mu_{\infty}$  for strong acids and bases to about 1%. The apparently high activity coeff. of strong acids and bases in aq. soln. is also traced to this cause. A modified Ostwald equation  $(\alpha x)^2/(1-x)V = K$ , based on the consideration that only free ions have the capacity of regenerating undissociated mols., has been developed for weaker electrolytes,  $\alpha$  being the activity coeff. This equation becomes identical with Ostwald's diln. law in the case of very weak electrolytes where  $\alpha$  is nearly equal to one, and gives concordant values for the equil. const. in the case of transition electrolytes where Ostwald's equation is not applicable.

R. H. LOMBARD.

**Electrochemical behavior of metals.** A. SMITS. *Proc. Acad. Sci. Amsterdam* 21, 158-71(1918).—A translation into English of the paper abstracted in *C. A.* 12, 2479.

E. H.

**Calorimetric lag.** WALTER P. WHITE. *J. Am. Chem. Soc.* 40, 1858-72(1918).—No matter how vigorous the stirring in a calorimeter, the temp. of some parts will lag behind the rest as long as the temp. of all is changing. These lags, however, depending on thermal cond. usually have simple and definite laws, and error from them is easily avoided by proper treatment. (1) The lags of thermometers and other bodies within the calorimeter, which have already been discussed, are more carefully re-stated, and prove to be as follows, for the lag  $L$  (in minutes) of any single body, as a thermometer: (a) A principal effect,  $= LK\Delta\theta'$ , where  $K$  is the thermal leakage modulus of the calorimeter,  $\Delta\theta'$  the temp. rise; this is equivalent to a change in the effective heat capacity of the calorimeter; (b) an avoidable effect depending on change in *jacket* temp. which makes the effective heat capacity different in adiabatic work; (c) smaller effects  $= LK\eta$ , where  $\eta$  is the "cooling correction," a few percent of  $\Delta\theta$ . (2) The mathematically more considerable problem of the lag effect of external bodies (shields, the air, solid insulators) is attacked, and the same 3 kinds of lag effect are found to be possible in all cases. The effective heat capacity of a convection shield around a calorimeter can be made  $1/4$  the actual capacity, and appreciable change in this will seldom occur except through great carelessness. Insulating packings are very undesirable, on account of the time required for equil. Calorimeter covers of any other material than metal are undesirable from nearly every point of view. Temp. distribution in aneroid calorimeters also receives attention.

W. P. WHITE.

**The conditions of calorimetric precision.** WALTER P. WHITE. *J. Am. Chem. Soc.* 40, 1872-86(1918).—Changes in the magnitude of the thermal leakage modulus  $K$ , of the calorimeter, or in the magnitude of the thermal head  $\varphi$ , that is, the mean temp. difference of calorimeter and environment, do not, as a rule, change very much the errors in these quantities, and therefore are of advantage only as these quantities

are the multipliers of other errors. Thus, the thermal leakage effect ("cooling correction") is  $KT\phi$ , where  $T$  is *time*; hence diminishing  $T$  diminishes the effect of errors in  $K$  or  $\phi$ , diminishing  $K$  diminishes the effect of errors in  $\phi$ . Since errors in  $K$  are important only in protracted detns. it is only for them that a diminution in  $\phi$  is important. Hence, contrary to widely held opinion, 2 favorite methods of diminishing  $\phi$ , the adiabatic, and the practice of starting the calorimeter below the jacket in temp. do not appreciably diminish the effect of this one of the *main* thermal leakage errors. It also follows from the peculiarities of the leakage effect computation that they do not diminish the effect of the (purely thermometric) error in detg. the leakage rate. The effect of this error can be diminished in other ways. Errors connected with stirring become important in delicate measurements. They can be reduced by controlling the speed, and also, and more effectively, by proper design, and by diminishing  $K$ , which diminishes the need for stirring. Evapn. and lags are touched upon, and a mathematical treatment is given, apparently for the first time, of the error from conduction along wires.

W. P. WHITE.

**Calorimetric methods and devices.** WALTER P. WHITE. *J. Am. Chem. Soc.* 40, 1887-98(1918).—The general rules derived in the paper of the preceding abstract are applied in a discussion of the efficiency of, or best methods to use with, the following devices or methods, only the last of which is new: Water cap and submarine types of complete jacket; various stirring devices; vacuum-jacketed calorimeters; the adiabatic method; aneroid calorimeters; twin calorimeters; the measured shield. *Vacuum jacketed calorimeters* are most clearly advantageous in crude work. Inconvenient in precision work, they may still be needed in extreme cases. *The adiabatic method* avoids (1) several small lag effects, (2) much of the evapn. error and (3) the labor of certain calcns. and (4) furnishes a valuable alternative method. The notion that it diminishes the main thermal leakage errors is incorrect. (Cf. preceding abstract.) *Aneroid calorimeters* may advantageously be made as small as the experimenter can handle. There is always a gain in quickness and usually in precision. *The measured shield* is a convection shield of very thin metal around the calorimeter, supplied with thermoelements running to the jacket, which are used for the measurement of thermal head. It leaves the calorimeter quite free, and yet gives more than the advantage of thermoelements on the calorimeter. In some important ways it is more effective than vacuum jacketing.

WALTER P. WHITE.

**Combustion of an explosive gas mixture within a closed vessel.** L. FLAMM AND H. MACHE. *Akad. Wiss. Wien. Ber.* 126, 9-44(1917); *Sci. Abstracts* 21A, 269-70 (1918).—Calcns. are made relating to a spherical bomb containing combustible gas mixt. which is ignited exactly in the center. The most important data for the problems investigated are the rise of pressure in the bomb during the progress of the combustion and the temp. and sp. vol. of the combustion products. A formula is obtained which in the authors' opinion will afford a better interpretation of the exptl. results than those hitherto in use, owing to the smaller number of assumptions made. The question is investigated as to how far the important explosion method of Mallard and Le Chatelier for the estn. of the sp. heats of gases at high temps. needs correction on account of the temp. variations which arise after combustion commences. The relationship is examd. between the change of the combustion velocity of a gas mixt. and its initial temp. and pressure, whereby an insight is afforded into the mechanism of the combustion procedure within an explosion motor.

D. MACRAE.

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Revised Ed. Boston: Ginn & Co. 400 pp. \$1.28. For review see *J. Am. Chem. Soc.* 40, 1957(1918).

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### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

System of radioactive elements. INGO W. D. HACKH. *Chem. Met. Eng.* 19, 751-2(1918).—A review, emphasizing the position of the radioactive elements in the periodic table. Cf. *C. A.* 12, 1607. G. L. WENDT.

Radium and radioactivity. CHAS. H. VIOL. Pittsburg. *Chem. Met. Eng.* 19, 752(1918).—An address. Nearly 2 oz. of high purity Ra have now been produced in this country. The U. S. Bureau of Mines estd. in 1914 that the total available Ra in the carnotite ores of the U. S. did not exceed  $3\frac{1}{2}$  oz., and asked for Government reservation of Ra lands. The standard Chem. Co. now estimates that at least 20 oz. of Ra can be prepd. from Colo. carnotite. G. L. WENDT.

Ionization of gases during chemical reactions. ALEXANDER PINKUS. Univ. Geneva. *Helvetica Chimica Acta*, 1, 141-5(1918).—An attempt to detect electron emission during gaseous chem. reactions, avoiding such physical causes of emission as incandescence, luminescence, spraying, etc. Ionization was detected by the increased rate of discharge of a bifilar electrometer in elec. connection with a charged Pt electrode sealed directly through the walls of a glass reaction bulb. The reaction  $2\text{NO} + \text{O}_2 = 2\text{NO}_2$  gave no ions. The total pressure varied from  $\frac{1}{4}$  to  $\frac{1}{2}$  atms. and the proportions of NO varied from 0.5 to 8 vols. per vol. of  $\text{O}_2$ . The reaction  $2\text{NO} + \text{Cl}_2 = 2\text{NOCl}$  gave no ionization unless the  $\text{Cl}_2$  was present in excess, and gave no marked ionization unless 2 vols. of  $\text{Cl}_2$  or more were present for each vol. of NO. The formation of  $\text{NOCl}$  is suggested, the decompn. of which may be the cause of ionization. G. L. WENDT.

Crystalloluminescence. II. HARRY B. WEISER. Rice Inst., Houston. *J. Phys. Chem.* 22, 576-95(1918); cf. *C. A.* 12, 2490.—The light emitted by crystals of  $\text{As}_2\text{O}_3$  and of  $2\text{K}_2\text{SO}_4 \cdot \text{Na}_2\text{SO}_4$  when crushed (triboluminescence) lies in the same region of the spectrum as the light emitted when these crystals are formed by rapid precipitation from soln. (crystalloluminescence). Both phenomena are attributed to the rapid reformation of mols., these having been broken up by the violent disruption of crystals in the one case, and by elec. dissociation in the other. Triboluminescence is the more common. All crystalloluminescent substances are triboluminescent. The intensity of triboluminescence varies widely in different substances. G. L. W.

**Types of phosphorescence.** EDWARD L. NICHOLS AND H. L. HOWES. Cornell Univ. *Proc. Nat. Acad. Sci.* 4, 305-12(1918); cf. *C. A.* 11, 1784; 12, 2163.—It was formerly assumed that curves of decay of phosphorescent bodies were all of the same type. Two different types have been shown by the authors to exist: (1) persistent phosphorescence which is made up of a succession of linear processes of diminishing slope proceeding from the origin of time, (2) vanishing type in which the linear processes are of decreasing slope. The location of the breaks is dependent on the intensity of excitation in the case of uranyl salts. In uranyl compds. and in Franklin Furnace calcite both types may be obtained, the vanishing under photo-excitation and the persistent under cathode discharge. The two types are entirely independent of each other, and calcite crystals after cathode bombardment *do not* show persistent curves when photo-excited. Willemite apparently shows both types with a single source of excitation, but this is probably due to the fact that there are two varieties, one of which is persistent under both excitations and the other vanishing under both. Either both types occur in the same sample or there is an admixture of calcite. Not all phosphorescence of quick decay is of the vanishing type, as is shown by the curves for  $\text{ZnCl}_2$ ,  $\text{CdCl}_2$ ,  $\text{CdSO}_4$  each mixed with  $\text{MnSO}_4$  and fused with  $\text{Na}_2\text{SO}_4$ . In the persistent type with short duration, the initial process may be very rapid, but if it does not go to the limit of visibility, the glow may persist for a considerable time. Cd phosphate exhibits a compound curve which is due to overlapping bands in the phosphorescence spectrum. Curves exhibiting the new type of vanishing decay resemble those obtained by infra-red excitation on Sidot blend. Here the application of infra-red rays hastens the decay, but in the other cases studied this could not be accomplished. Hence the successively steeper processes are probably due to a change in the rate of recombination of the ejected electrons with the active phosphorescing groups; or the sudden change may be due to a change in the electric field concomitant with the changed orientation of the charged particles, which drives the ejected electrons in greater proportion to the non-active portion of the mol. F. C. HORT.

**The photoluminescence and cathodoluminescence of calcite.** E. L. NICHOLS, H. L. HOWES AND D. T. WILBER. Cornell Univ. *Phys. Rev.* 12, 351-67(1918); cf. *C. A.* 12, 1263 and preceding abstract.—The characteristic ruddy phosphorescence of Franklin Furnace, N. J., calcites appears to be due to the presence of Mn.  $\text{CaCO}_3$  artificially prepared is rendered similarly phosphorescent by the addition of a Mn salt and subsequent heat treatment. This suggests that the luminescent centers are actually  $\text{CaO}$  with  $\text{MnO}$  or other oxide attached in a special manner. The phosphorescences under excitation by light from an Fe spark and by cathode-ray bombardment were quant. studied. The phosphorescence under photo-excitation is of the vanishing type, color ruddy, duration about 0.4 sec., and the decay curve shows three successive linear processes, a type which has heretofore been observed only with certain uranyl salts. The cathodoluminescence is persistent, measurable after 300 sec., red in color, and the decay curves are of the usual, *i. e.*, sulfide, type with a series of linear processes. The red and green regions of the spectrum are both affected by rising temp., the red attaining a max. intensity at about  $70^\circ$  and the green at about  $160^\circ$ , while both become too dim to measure at about  $350^\circ$ . Spectrophotometric measurements show two series of overlapping bands spaced equally in frequency units. The rate of decay of the phosphorescence is not affected by the application of red or infra-red radiation. The action of cathode rays does not render these calcites even temporarily capable of persistent phosphorescence under photo-excitation, but the vanishing photo-excited phosphorescence may be superimposed on the persistent phosphorescence of cathodo-excitation either during or after exposures to the cathode rays. G. L. WENDT.



**The mechanism of light emission.** E. P. LEWIS. *Sci. Monthly* 7, 97-111(1918).—A popular discussion of radiation in relation to theory of atomic structure. The respective difficulties facing the static type of structure proposed by J. J. Thomson and the kinematic "astronomical" atom proposed by Rutherford are clearly posed and critically examined. It is pointed out that the former is more consistent with chem., the latter with radioactive phenomena. S. E. SHEPPARD.

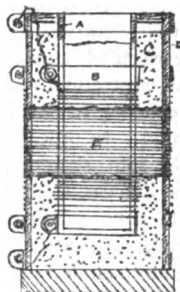
#### Bioluminescence (HARVEY) III.

**Solid radioactive preparation.** E. HEYDENREICH. U. S. 1,285,704, Nov. 26. A block of kieselguhr or similar porous material is formed with a cavity containing radio-Th and this block is placed in an acidulated weak soln. of NaCl to charge the liquid with emanation-producing material.

### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

**The Wild-Barfield electric muffle.** ANON. *Engineering* 106, 143(1918).—This muffle is fitted with a pyroscopic detector and is designed for the heating of C steel parts to the proper hardening temp. The inner pot *A*, the muffle chamber, is of refractory material wound with a heating and magnetizing coil *B*. The outside casing of the muffle is wound with a coil of special enamelled copper wire which forms the detecting coil *E*, and is connected with terminals to the galvanometer circuit. The compensator is used to balance irregularities of voltage in the heating and magnetizing circuit, so that a clear and steady reading is obtained on the galvanometer. When a current is passed through *B*, the muffle becomes heated and magnetizes the steel inside. Since the best temp. for quenching C steel is at the point where it becomes non-magnetic, a small current is automatically induced in the winding *E*, when this point is reached, indicating to the operator that the temp. for quenching has been attained. The power consumption of a muffle, having an internal dimension of 12" × 4", is 1.4 kilowatt for 1000°. W. E. RUDER.



**Canada's heritage in the St. Lawrence River.** A. V. WHITE. *Elec. World* 72, 1216-7(1918).—The estimated low-water power aggregates 2,000,000 h. p. This is of particular interest to the electrochem. industries. A brief account of the various prospects is given. C. G. F.

**Electric steel furnaces in England.** F. J. MOFFET. *Elec. Rev.* 73, 1000(1918).—There were 140 elec. steel furnaces operating in England in 1917. About half of these are in the Sheffield and Rotherham districts. The Héroult furnace is most commonly used; next in order are Greaves-Etchell, Electrometals, Rennerfelt, and Stobie. The standard sizes of furnaces, with the transformer capacities and kw.-hrs. per ton of finished steel: 2800 lbs., 300 kw., 850 kw.-hrs. per ton; 2.5 tons (long), 500 kw., 800 kw.-hrs.; 5 tons, 800 kw., 750 kw.-hrs. At the Robert Hadfield works, Sheffield, the energy consumption in 1917 per ton of elec. steel was 782 kw.-hrs. based on a total production of 31,850 tons. C. G. F.

**The electrolytic deposition of iron from organic solvents.** E. H. ARCHIBALD AND L. A. PRIQUET. *Trans. Roy. Soc. Canada* 11, III, 107-12(1917).—A detailed report of 8 expts. in electrolysis of Fe solns. leads to the following conclusions: It is

possible to obtain complete deposition of Fe from solns. of  $\text{FeCl}_3$  in AcMe, and in AcMe and  $\text{H}_2\text{O}$ ; the Fe can be deposited entirely free from C. At low voltages the Fe is deposited in metallic form. As voltage is increased, the Fe comes down as a red deposit which adheres to the electrode, and allows the Fe to be removed from the soln. From solns. of  $\text{FeCl}_3$  in AcMe with EtOH, the Fe, although completely deposited, is contaminated with C. A soln. of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  in 1 part AcMe and 2 parts  $\text{H}_2\text{O}$  electrolyzed using 0.1 amp. 100 sq. cm. at 4.7 v., deposited gray metallic Fe on Pt or Ag electrodes. Upon raising the voltage to complete the sepn. of the Fe the deposit became red as above, but the removal of Fe from the electrolyte was complete. A similar soln. was prepared and 1 g.  $(\text{NH}_4)_2\text{SO}_4$  added, in order to lower the high resistance. This was then electrolyzed at 4.0 v. and current density 0.1 amp./100 sq. cm. As the electrolysis continued, the acidity of the soln. increased and it was found necessary to neutralize a part of the acid from time to time by adding  $\text{NH}_4\text{OH}$ . All the Fe was obtained as gray, adherent, weighable, metallic Fe. No  $\text{AcH}$  is formed during the electrolysis. It is thought that these facts could be used as a basis for the sepn. of Fe from other metals such as Al and Cr.

H. M. LANCASTER.

**The electrolytic precipitation of zinc.** D. MCINTOSH. *Trans. Roy. Soc. Canada* 11, III, 113-9 (1917).—This article, including 19 pages of plates showing photographs of electrolytic deposits obtained under various conditions, is not intended to present anything new to those who have worked on the pptn. of Zn, but contains many points of interest to those unfamiliar with the process. The exptl. work was carried out at Trail. Portions of about 2500 cc. of a soln. containing 4.0-5.0% Zn were electrolyzed between Pb anodes and Al cathode with a c. d. of 20-30 amp. per sq. ft. In general, the electrolysis was continued until the Zn had been brought to about 0.5%, the acid increasing to 6-7%. Various impurities were added before electrolysis, and the effect noted. In order to secure good deposits the following conditions should be observed: The soln. should be absolutely clear and free from colloids. The Fe should be low. As, Sb, Cu, Co, Ni and in general, metals more electropositive than Zn must be absent. The soln., particularly in tanks containing large amts. of acid, should be cold. The Zn deposits in a semi-passive form, but when it begins to dissolve, soln. cannot be stopped in any simple way. The concn. of the Zn should be as high as possible (6-7%). No attempt should be made to electrolyze a soln. containing less than 2.0-1.5% Zn. With the ordinary cascade system the optimum c. d. is 25-30 amps. per sq. ft. H. M. L.

**Resistance of pure insulating materials.** E. POPEZUS. *Verh. deut. physik. Ges.* 19, 231 (1918); *Elektrotechn. Z.* 39, 229 (1918).—A W ribbon 1 mm. wide and 0.2 mm. thick was wound into a helix 28 mm. long and 7.5 mm. in diam. The helix was mounted on the stem of a large incandescent lamp bulb and the ends of the ribbon were attached to the leading-in wires. Current of 50 cycles was passed through the ribbon and temp. measurements were made with a Holborn-Kurlbaum pyrometer.  $\text{CaO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{MgO}$ ,  $\text{ThO}_2$  and BN were compressed into small pencils 10 mm. long by 1.3 mm. diam., connected with a Wheatstonebridge and suspended in the W helix. The bulb was then evacuated. BN had the highest resistance at incandescent temp. The introduction of N into the bulb caused the resistance (temp. = const.) to drop with all oxides, except  $\text{Al}_2\text{O}_3$ .

C. G. F.

**The design of porcelain insulators from the ceramic standpoint.** G. I. GILCHRIST AND T. A. KLINEFELTER. *Elec. J.* 15, 443-5, 489-92 (1918).—G. and K. found that quality is detd. by the kind of blanks, method of handling the clay and throwing into molds, general speed in working, and the accuracy of the machines. Abrupt changes in thickness and sharp corners increase the liability to crack, and in glazing, the surface tension of the glaze pulls it away from sharp edges and floods abrupt corners. In baking, the most trouble develops from too small a placing surface, with attendant

breakage. Thick walls and thin central holes should be avoided and corrugations made not too thin nor too deep. From a theoretical standpoint, a conception was formed of the functions which air and solid dielectrics perform when used in combination for insulating purposes. Based on this conception, a large number of tests were made under commercial conditions, which show that it is possible to use air more efficiently than has been customary in the past. Breakdowns of an air path over a surface were obtained which average as high as 9.4 kv. per cm. effective value (23,900 volts per in.) over a distance of 17.0 cm. The conditions of design are such that these same averages may be maintained at any voltage by increasing all dimensions of the structure proportionately. A max. efficiency of air path over a surface was obtained when the surface of the dielectric is made to conform to the flow lines between the terminals. The strength of such a path is independent of the specific inductive capacity of the dielectric. The principal thing to be considered, therefore, is the proper shaping of the terminals in order that points of high intensity may be eliminated and a high av. intensity obtained for the given path.

W. H. BOYNTON.

**Electrical precipitation of metals in waste gases.** ANON. *Elec. World* 72, 1169 (1918).—See C. A. 12, 2495.

W. H. BOYNTON.

**New power-factor recording instruments.** ANON. *Elec. Rev.* 73, 1025 (1918).

C. G. F.

**Graphs for finding safe current-carrying capacity of insulated wire.** M. C. MASON. *Elec. Rev.* 73, 1020 (1918).—Two graphs are shown, based on the National Electric Code rule No. 18.

C. G. F.

The electrochemical investigations of Prof. Dr. E. Cohen (HELDERMAN) 2. Constitution and thermal stability of carbides (RUFF, *et al*) 6.

**Storage battery.** J. P. MENTZER. U. S. 1,285,303, Nov. 19. Storage battery separators are formed of kieselguhr mixed with  $\text{CaSO}_4$  and fibrous material.

**Storage-battery.** B. FORD. U. S. 1,285,658, Nov. 26. Structural features.

**Storage-battery.** B. FORD. U. S. 1,285,660, Nov. 26. Structural features.

**Galvanic battery.** H. A. STOFFLET. U. S. 1,285,831, Nov. 26. Structural features.

**Electric battery.** H. F. FRENCH and R. C. BENNER. U. S. 1,285,054, Nov. 19. Elec. batteries are formed with a Zn electrode and an electrolyte of  $\text{NH}_4\text{OH}$  and  $\text{NaOH}$  or  $\text{KOH}$  soln. The  $\text{NH}_4\text{OH}$  retards formation of crystals on the Zn electrode.

**Electroplating apparatus.** L. POTTHOFF. U. S. 1,285,369, Nov. 19.

**Electroplating apparatus.** J. E. WOODBURY. U. S. 1,285,875, Nov. 26.

**Electrolytic condenser.** R. D. MERSHON and J. S. RIDDILE. U. S. 1,285,305, Nov. 19. Film-coated Al electrodes of electrolytic condensers are wholly submerged in the electrolyte and are connected to the external circuit by filmed Al connecting devices attached to alternate electrodes and extending outside the electrolyte. This construction prevents attack on the electrodes at the surface of the electrolyte.

**Electrochemical reduction of ores and salts.** A. A. M. HANRIOT. U. S. 1,285,690, Nov. 26. The metallic components of materials such as  $\text{AgCl}$ , galena, malachite or cinnabar are obtained by placing the material in contact with the cathode in an electrolytic bath and passing an elec. current through the bath, using such a voltage that the metallic element, *e. g.*, Ag, Pb, Cu or Hg, will be converted into pure metal at the cathode and that a non-metallic constituent, *e. g.*, Cl or S, will be collected at the anode.

**Electric furnace.** B. RAEDER. U. S. 1,286,100, Nov. 26. The furnace is especially adapted for the production of Zn.

**Depositing clay, plumbago, or the like on molds.** B. J. ALLEN. Can., 185,733, July 30, 1918. The material is introduced in a liquid state into an absorbent mold and an elec. current is passed through the material between an electrode suspended therein and one in contact with the outer face of the mold.

**Electric furnace for refining zinc.** S. HULDT. Can. 187,865, Dec. 10, 1918. The furnace comprizes a chamber having an inlet opening communicating with the bottom, a vapor outlet at the top thereof, a feed receiver communicating with the inlet opening and adapted to retain a portion of the molten bath for closing the opening and a feed opening in the wall of the chamber.

**Production of cyanogen compounds.** A. R. LINDBLAD. Can. 187,728, Dec. 3, 1918. An alkali silicate with a reducing agent and lime is charged into an elec. furnace in the presence of N and heated to form cyanogen compds., which are removed from the furnace.

**Refining volatile metals.** S. HULDT. Can. 187,864, Dec. 10, 1918. Metal to be refined is fed into an elec. arc furnace through a liquid trap formed by said metal, so as to maintain a metal bath in the furnace bottom; the surface of the bath is exposed to heat from the arc and the metal vapors are removed and condensed.

**Accumulator electrode grids.** S. WILLNER. Can. 187,774, Dec. 3, 1918. The grid has a series of upright bars and a series of horizontal bars integral therewith and crossing the same so as to form spaces enclosed by two bars of each series, each bar where it forms a boundary between two of the spaces being perforated to give communication from one space to its neighbor.

**Mercury-vapor rectifier.** S. W. FARNSWORTH. U. S. 1,285,965, Nov. 26. A vapor converter with a Hg cathode and anodes of solid material is operated with a vacuum of less than 0.002 mm. Hg by passing load current through the app. while maintaining the anode at a temp. of 80-100°. This temp. regulation results in increased efficiency. U. S. 1,285,966 and 1,285,967 relate to structural features of vapor elec. converters.

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## 5. PHOTOGRAPHY.

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LOUIS DERR.

**Coloring materials in the photographic industry.** A. SEYEWETZ. *Chimie & industrie* 1, 492-500(1918).—There are dyes which sensitize the photographic plate to rays differing from those which the dyes absorb in soln., from which it may be concluded that the sensitizing power lies in the Ag-dye compd. analogous to a lake. The principal classes of sensitizing dyes are derivs. of di- and triphenylmethane, acridine, phenylacridine, and quinoline. For sensitizing for green and yellow, the phthaleins are the most important, in particular eosin, erythrosin, and rose Bengal. For yellow and orange, quinoline red, the rosaniline violets, especially ethyl violet, and the cyanines are used. For orange and red, the blue lepidine-cyanines are available, carrying the sensitiveness to the C-line of the spectrum; and, for red-sensitizing, the König series of orthochrome T, pinachrome, pinaverdol, homocol, ethylcyanine, pinacyanol, and dicyanin, carrying the sensitiveness to the B-line without undue blue-sensitiveness. For a non-halation backing, to be placed between the emulsion and the support and decolorized for subsequent printing, rosolic acid and Congo red are among the few known dyes suitable. For 3-color filters, methylene blue is suggested for the blue, a mixt. of erythrosin and metanile yellow for the orange, and a mixt. of methylene blue

and auramine for the yellow. For the red-blue-yellow colors of positives, erythrosin J, chrysophenine A, and pure diamine blue are named. The Traube process is based on the power of AgI to fix a large number of acid and basic dyes, such as methyl violet, ethyl green, quinoline red, rhodamine, eosin, auramine, methylene blue, and others. For processes involving the leucobases, reassuming color under the impact of light, *o*-chlorotetraethyl-diaminotriphenylmethane is used for blue, the leucobase of malachite green for green, *p*-leucaniline or the leuco-rhodamines for red, hexamethyl-*p*-leucaniline for violet, and leuco-fluoresceine or leuco-flavaniline for yellow; the fixing is by monochloroacetic acid. For the bleach-out processes, methylene blue, auramine, and erythrosin in gelatin, sensitized by  $H_2O_2$  are used; but primrose, Victoria blue, cyanine, curcuma, and auramine, sensitized by anethol, are better; these processes are, however, imperfect. L. DERR.

**New photographic mordant dye process.** F. E. IVES. *J. Frank Inst.* 186, 755-7 (1918).—The so-called "mordant-dye" process of producing colored prints, introduced by Traube, depends on the conversion of the Ag image into AgI, which becomes strongly colored by immersion in basic dyes. The dye is fixed by tannin, the AgI dissolved out, and a transparent dye-image is left. Ag ferrocyanide and chromate and other Ag salts can be similarly dyed, but not well; but a Cu-toned image possesses the same property to a most useful degree (*C. A.* 12, 2170). A new mordant is described, a Cr compd. of nature undetd. It is produced by bleaching the image in a soln. of equal parts of 1.5% KCN and 1.5% chromic acid, washing out the free acid after bleaching, preferably in water contg. a little  $NaHCO_3$ . A typical dye-bath is 0.3 g. safranin in 115 cc. alc., adding 1 l. water slightly acidified with AcOH. After immersion, which may require 30 min., the film may be cleared from surplus dye by a wash in water contg. a very little AcOH. Other very active dyes are malachite green and auramine. L. D.

**Color photography.** HESS-IVES CORPORATION. *Brit.* 119,854, June 7, 1918. In the production of multi-colored photographs or cinematograph films, two colored images are produced by exposure, etc., on opposite sides of a colloid layer supported on a base; one image may be a Cu-toned Ag image or a Cu-toned and mordant-dyed Ag image, and the other image may be a cyanotype image. The first image may be printed on to a colloid layer sensitized with a Ag halide, and through the base supporting it, from a green-representing negative, and after development, etc., of the image, the colloid layer may be resensitized in a 2% bath of green citrate of Fe and  $NH_4$ , blotted off, and dried. The other surface of the layer is then exposed under a red-representing negative and the image is developed with a 1% soln. of  $K_4Fe(CN)_6$ , the two images being confined largely to their respective sides of the colloid layer. The Ag image is next converted into a red pigment image by means of a Cu toning bath and may be fixed with  $Na_2S_2O_4$ , or the toning may be performed before the second sensitizing. The color of the red image may be modified or intensified by treatment with a basic dye such as fuchsine or auramine, which is mordanted by the Cu image, and the color of the cyanotype image may be modified by the addition of a reagent such as  $K_2Mn_2O_8$  to the developer, or by treatment after development with a dil., slightly acid, soln. of  $K_2Cr_2O_7$ . A third colored image may be combined with images prepd. as above set forth.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

**Constitution and thermal stability of carbides.** OTTO RUFF, E. JELLINEK AND T. FORER. *Breslau. Z. Elektrochem.* 24, 157-62 (1918).—Expts. were carried out in an

elec. furnace of the Arsem vacuum furnace type, having a C resistor. In the first expts., a pressure less than 3 to 5 mm. was not attainable; the residual gases N, H and CO, brought about a "transfer" of C from the incandescent resistor tube to metals, oxides, etc., under investigation: *e. g.*, incandescent  $C + 2H_2 = CH_4$  and then  $CH_4 + M = MC + 2H_2$  where M represents the metal. W is thus readily transformed into carbide and the m. p. of the metal drops from  $3200^\circ$  down to  $2650^\circ$  (corresponding to a W-C alloy with 0.8% C) within a few seconds. To retard, or entirely to prevent the formation of carbides, argon gas was introduced into the vacuum furnace (Ger. patent 295,050, Nov. 26, 1915). Expts. on the formation of carbides lead to the conclusion that metal carbides, in general, are stable up to temps. above  $2500^\circ$  and that even at these elevated temps. C does not dissolve in the metals as such, but as a carbide of the metals. *Al + C series:* Liquid Al dissolves but little C, but readily forms the solid carbide  $Al_4C_3$ . It is very difficult to produce  $Al_4C_3$  free from N. The existence of a second carbide,  $Al_3C_2$ , appears very probable. At pressures below 400 mm.  $Al_4C_3$  volatilizes without melting; at about 400 mm. and  $2200^\circ$  the carbide fuses with partial decompn. into graphite and Al. Pure Al metal was heated in a graphite crucible in H at 1 atm. at various temps. When heated to temps. below  $2200^\circ$ ,  $Al_4C_3$  was formed; when heated at  $2200^\circ$ ,  $Al_4C_3$  plus Al was formed and when heated above  $2200^\circ$ , graphite alone remained. At  $2270^\circ$  the Al carbide vapor was found to contain 13.3% to 14.1% C (vapor pressure curve is shown). *The Cr + C series:* At about  $1900^\circ$  Cr dissolves 12% C; with rising temps. the soly. increases at first very slowly up to about  $2250^\circ$  ( $Cr_3C_2$ ); above this temp. the soly. increases more rapidly (formation of  $CrC$ ?). At a temp. of  $1400^\circ$  the carbide  $Cr_3C_2$  seps. out. All of the Cr carbides were insol. in cold 2 N HCl (in the absence of air) whereas Cr metal was sol. (etching of metallographic sections).  $Cr_3C_2$  is insol. in hot concd. HCl but the lower carbides are sol. The b. p. of Cr satd. with C is  $2270^\circ$ . The stable satd. carbide of Mo is  $Mo_2C$ . To date, the known metal carbides conform with the following hydrocarbons:  $CH_4$ ,  $C_2H_6$ ,  $C_2H_4$ ,  $C_2H_2$  and  $C_4H_{10}$ . The valency of the metal in the carbide is usually lower than that commonly assumed. The heavy metals generally form monocarbides. In the case of most metals, the C concn. increases with increasing temp., *e. g.*,  $W_3C$ ,  $W_2C$ ,  $WC$ . Within wide temp. limits carbides such as  $Mn_3C$ ,  $Cr_3C_2$  and  $W_3C$  are very stable; carbides such as  $Fe_3C$ ,  $WC$  and  $Cr_3C_2$  decompose upon lowering the temp. to the m. p. of the alloy into metal plus C.  $Fe_3C$  is hard to obtain in the solid phase and  $Ni_3C$  is altogether unstable as solid. All carbides dissociate more or less completely upon volatilization. The more electropositive a metal, the more stable its carbide: upon vaporizing  $Fe_3C$  is almost completely dissociated;  $Al_4C_3$ , however, is only partially dissociated.

C. G. F.

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Zirconyl basic benzoates and salicylates (VENABLE, BLAYLOCK) 10.

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## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Thymolphthalein as an indicator in the acidimetry and alkalimetry of dark solutions. D. HOLDE. *Chem. Umschau Fette, Oele, Wachse u. Harze* 25, 73(1918).—Thymolphthalein is described. A few drops of a 1% soln. in alc. are sufficient to give the change from colorless to blue by the least excess of alkali. H. has made some assays of dark oils using thymolphthalein; in some of these the change of color could be easily observed, especially by running down the benzene or ether-alc. soln. along the sides of the flask. Naturally a mixed color also arises from the usually brown

to the red-black coloration of the dark oils or soap solns., which is to be taken into consideration.

TH. VERHEGGEN.

**Determination of carbon in steel and ferro-alloys, especially in ferrochrome.** P. KOCH. *Stahl u. Eisen* 38, 219-21(1918).—Since elec. resistance furnaces have been introduced into the labs. of the iron-works C is detd. in iron and steel and in the ferro-alloys by direct combustion in an O current. The principal conditions to be obtained in this process are the complete combustion of the C into  $\text{CO}_2$  and, in the case of material rich in S, the avoidance of harm from generated  $\text{SO}_3$  or  $\text{SO}_2$ . The temp. of the furnace should not be less than  $1000^\circ$  and it must remain below the fusion point of the metal being examd.; if not the metal would melt before being completely decarburized, and if the temp. is too high the  $\text{CO}_2$  will be dissociated into  $\text{CO} + \text{O}$ , and the  $\text{FeSO}_4$  formed may also be decomposed with evolution of  $\text{SO}_2$  or  $\text{SO}_3$ . To make  $\text{SO}_2$  harmless, chromic acid or  $\text{PbO}_2$  are used. For normal amounts of S this is hardly necessary. A complete oxidation of C is best obtained while operating upon fine shavings. Cr steel and Ni steel, poor in C, are oxidized with more difficulty; the best condition for combustion is a high temp. in O under feeble pressure. Sometimes it is necessary to add an oxidizing agent to the metal to be examd., this is the case with ferro-chrome to which is added Bi trioxide. Co oxide is also a good oxidizing agent. The author describes in detail both gravimetric and volumetric methods for the detn. of C in ferro-chrome.

TH. VERHEGGEN.

**Tungstic and molybdic compounds as precipitating reagents for certain basic organic compounds.** LUIS GUGLIAMELLI. *Anales soc. quim. Argentina* 6, 57-64. —G. studied the reactions of the following compds. of W and Mo on a no. of pyrazole, purine, quinoline and pyridine bases (also amino-imine bases of diphenyl-methane): (1) Na tungstate—1% aq. soln.; (2) arsenotungstic reagent—prepd. by adding 10 g. Na tungstate and 25 g.  $\text{As}_2\text{O}_3$  to 100 cc.  $\text{H}_2\text{O}$  and boiling under a reflux condenser for 2 hrs.; (3) silicotungstic reagent—10% soln. prepd. according to Copaux; (4) phosphotungstic reagent—prepd. by dissolving 100 g. Na phosphotungstate in 100 cc. of 5% aq. HCl; (5) Na molybdate soln. of 100 g. of the salt in 100 cc. of 5% aq. HCl; (6) arsenomolybdic reagent—prepd. in the same manner as (2), the tungstate being replaced by molybdate; (7) phosphomolybdic reagent—10 g. of phosphomolybdic acid in 100 cc. of 5% aq. HCl; (8) arsenotungstomolybdic reagent—prepd. by boiling for 2 hrs. under a reflux condenser a soln. containing 10% Na tungstate, 1% Na molybdate and 25%  $\text{As}_2\text{O}_3$ ; (9) arsenovanadotungstic reagent—prepd. same as (8), Na molybdate being replaced by Na vanadate. The above reagents were also tested in comparison with Mayer's reagent. In making the tests 1 cc. of the reagent was added to approx. 5 cc. of the soln. of the organic base. Varying results were obtained and no general rule could be formulated. (1) gave distinct ppts. with 1:1000-2500 solns. of quinoline and a 1:2500 soln. of cinchonine, but gave no ppt. after 24 hrs. with 5% solns. of  $\text{C}_6\text{H}_5\text{N}$  and nicotine. (2) pptd. all the bases except caffeine, (3) pptd. caffeine but not  $\alpha$ - and  $\beta$ -naphthylamine and  $\text{C}_6\text{H}_5\text{N}$ . (4) gave no ppt. with cocaine. (5) in spite of its similarity to (1) reacted somewhat differently; it gave no ppt. with cocaine, quinoline and  $\alpha$ - and  $\beta$ -naphthylamine, (6) pptd. only cinchonine. (7) was an excellent general precipitant and produced ppts. of general crystalline appearance in very dil. solns. (8) behaved the same as (2). (9) gave no ppt. with caffeine, antipyrine and pyrazidone. Practically all of the above reagents, especially (2) and (7) were fully as efficient general precipitants as Mayer's reagent. The following bases were tested with the foregoing reagents:  $\alpha$ -naphthylamine,  $\beta$ -naphthylamine, benzidine, antipyrine, pyrazidone, pyridine, nicotine, quinoline, cinchonine, caffeine, cocaine, auramine. The results obtained in each case are shown in detail in tabulated data.

H. S. PAINE.

**New sensitive reaction for pyrimidone and its differentiation from antipyrine.** LUCIANO P. J. PALET. *Anales soc. quim. Argentina* 6, 151-5(1918).—An aq. soln. of pyrimidone treated with several drops of a freshly prepd. aq. soln. of  $K_3Fe(CN)_6$  and  $Fe_2Cl_6$  gives a characteristic blue color and ppt. of Prussian blue; the reaction is very sensitive. Pyrimidone may thus be clearly differentiated from other organic compds. which accompany it in various therapeutic preps. For instance, the  $K_3Fe(CN)_6$ - $Fe_2Cl_6$  reagent gave a blood-red color and ppt. with antipyrine, a violet-red color with salipyrine and a negative reaction with phenacetine, acetanilide, aspirin, exalgin and caffeine. When pyrimidone and antipyrine are both present a poorly defined dark color due to mixt. of the colors of the 2 reactions is produced. This may be obviated by adding HCl; the blood-red color and ppt. due to antipyrine then changes to a light yellow color and the blue color due to pyrimidone persists. Traces of pyrimidone may thus be detected in the presence of a great excess of antipyrine. The reaction given by other reagents with (1) pyrimidone and (2) antipyrine, resp., are as follows: Guglielmelli's arsenotungstic reagent—(1) white ppt. sol. in alkali with intense blue color, (2) white ppt. sol. in alkali without coloration; Guglielmelli's arsenotungstomolybdic reagent—(1) white ppt. sol. in alkali with indigo blue color, (2) white ppt. sol. in alkali without coloration;  $Fe_2Cl_6$ —(1) red color changing to yellow after action of  $H_2SO_4$ , (2) violet-blue color practically unaffected by  $H_2SO_4$ ;  $NaNO_2$  and  $AcOH$  or  $H_2SO_4$ —(1) transient amethyst-violet color, (2) bluish green color changing to blood red after boiling with  $HNO_3$ ;  $H_2SO_4$ ,  $NaNO_2$  and  $NH_4OH$ —(1) violet color which disappears after addition of the  $NH_4OH$ , (2) intense green color which persists after addition of the  $NH_4OH$ ;  $AgNO_3$ —(1) intense blue color which changes to violet with deposition of reduced Ag, (2) no color change (soln. colorless); HCl, HCHO and  $NH_4OH$ —(1) no color change (soln. colorless), (2) white ppt.; soln. of gum arabic in the cold and with aeration—(1) violet-blue color, (2) no color change; alfalfa roots and  $H_2O_2$ —(1) violet color, (2) no color change.

H. S. PAINE.

**Action of the potassium ferricyanide and ferric chloride reagent on alkaloids, glucosides and other plant constituents.** LUCIANO P. J. PALET. *Anales soc. quim. Argentina* 6, 156-8(1918).—P. tested the action of the  $K_3Fe(CN)_6$ - $Fe_2Cl_6$  reagent (cf. preceding abstract) on 102 plant constituents. A positive reaction was given by the following alkaloids: apomorphine, beberine, berberine, brucine, codeine, colchicine, curarine, emetine, sparteine, erythrofeine, physostygmine, hydrastine, morphine, meconine, napeline, narcotine, pelletierine, pseudopelletierine, pereirine, sabadilline. A positive reaction was obtained with the following glucosides: adonidin, apocinin, arbutin, apiin, boldin, convalamarin, esculin, strophanthin, smilacin, floridin, globularin, graciolin, helleborin, hesperidin, sabatin, salicin, sapotoxin, siringuin. A positive reaction was obtained with the following bitter principles: aloin, *cotoina verum*, scoparin.

H. S. PAINE.

**Rapid detection of morphine in the chemico-toxicological analysis of viscera.** LUCIANO P. J. PALET. *Anales soc. quim. Argentina* 6, 349-51(1918).—P. reports excellent results with the following modified Flückiger procedure for the rapid detection of small amts. of morphine:  $MgO$  was added to 120 g. viscera so as to form a somewhat stiff paste which was then heated to dryness on a  $H_2O$  bath. The well pulverized residue was then heated to boiling with  $Me_2CO$  (in a Soxhlet extractor if desired) and to the  $Me_2CO$  filtrate were added 2-3 cc.  $H_2O$  and several drops  $AcOH$ ; this mixt. was filtered and evapd. to dryness. This residue which contains the morphine with impurities is purified by adding 5% of  $AcOH$ , filtering and extg. the morphine from the filtrate by rendering it alk. with  $NH_4OH$  and using boiling  $CHCl_3$  as solvent. If the viscera are obtained from a cadaver in advanced stage of decompn. the  $CHCl_3$  residue should be purified by the Schaer method (using chloral hydrate).



In most instances very pure residues permitting the rapid detection of morphine or its derivs. are obtained. Regardless of the color reactions which may be employed the Marquis reaction which permits detection of oxymorphine should never be omitted in view of the possible oxidation of morphine in the kidneys. This method has been successfully applied to detection of small amts. of morphine in the case of death suspected to have been caused by small doses of laudanum.

H. S. PAINE.

**Distinction between different abrasives and the detection of carborundum in them.**

R. PETERS. *Pharm. Zentr.* 58, 217-9, 231-4(1917); *J. Soc. Chem. Ind.* 37, 335A.—Artificial corundum has a deeper grayish blue color than natural emery. It is distinguished from emery by the presence of microscopic inclusions of gas and is also less magnetic. It can be detected by heating the previously ignited sample with 20 parts of  $\text{PbCrO}_4$  in a hard glass tube; the mass becomes red hot with liberation of  $\text{CO}_2$ ; this will detect as low as 5%. For the detn. of small amts. it is necessary to treat the residue insol. in fused  $\text{KHSO}_4$  repeatedly with  $\text{HF}$  and  $\text{H}_2\text{SO}_4$  until a const. wt. is obtained. When small amts. of carborundum are present, the C may be detd. by heating the previously powdered and ignited sample with  $\text{KClO}_3$  and  $\text{PbCrO}_4$  in a current of air for about 1 hr., the  $\text{CO}_2$  being absorbed in  $\text{Ba(OH)}_2$  soln. after successive washings with  $\text{AgNO}_3$  and  $\text{FeSO}_4$  solns.

C. O. EWING.

**Electrodeposition of iron from organic solvents (ARCHIBALD, PIQUET) 4.**

STOCK-STÄHLER: *Praktikum der quantitativen anorganischen Analyse*. 2nd Ed. Berlin: Julius Springer. 144 pp. M. 7.60.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

**Mineralogy of the H. B. Mine, Salmo, B. C.** T. L. WALKER. Univ. Toronto. *Studies* (Geol. series), No. 10, 25 pp.(1918).—The occurrence, crystallography, physical properties and chem. compn. of the minerals of this deposit are described in detail. Some of the data have been previously published (cf. *C. A.* 11, 433, 1389, 2570). The new matter includes analyses of calamine, parahopeite and a clay high in Zn. It is pointed out that 5 distinct phosphates of Zn are now known, and from the chem. point of view all of them are remarkable for their unusual purity and absence of isomorphous replacements. The source of the P entering into the compn. of the minerals at this mine is considered; it is believed to have been a phosphatic bed in the Carboniferous strata of the region.

E. T. W.

**Notes on the origin of colerainite.** EUGENE POITEVIN. *Trans. Royal Soc. Canada* [3] 12, 37-9(1918).—When first discovered colerainite was thought to be of secondary pneumatolytic origin, that is, formed by the action of the magmatic fluids accompanying the intrusion of pegmatite or aplite. Field observations have now shown that the dikes carrying the colerainite do not contain any characteristic products of secondary pneumatolysis, but do contain mica and other primary minerals incapable of withstanding the solvent action of magmatic fluids. Further, the colerainite is limited to the portions of the dikes which have been subject to the influence of surface waters, and is there associated with kaolinite, porcellophite, and aphrodite, all secondary minerals. It is, therefore, believed that the colerainite has been formed in the pegmatite dikes as a result of interaction between the Al minerals of the dikes and Mg salts carried down by surface waters, a possible reaction being:  $2\text{NaAlSi}_3\text{O}_8 + \text{CO}_2 + 4\text{MgO} + 5\text{H}_2\text{O} = 2\text{H}_2\text{Mg}_3\text{AlSiO}_5 + \text{Na}_2\text{CO}_3 + 4\text{SiO}_2$ .

E. T. W.

**The Alsace potash deposits and their economic significance in relation to terms of peace.** PAUL KESTNER. *J. Soc. Chem. Ind.* 37, 291-97(1918).—A rich deposit of potash was discovered in 1904 in southern Alsace, consisting of 2 beds, each 4 m. thick, underlying an area of 200 sq. kilometers. The deposit represents more than 300 million tons of salts of great purity, composed chiefly of sylvite. Previous to the war, the output was carefully controlled by the Kali Syndicate in favor of the Stassfurt deposits. While Germany possesses Alsace she has the monopoly of potash, and to insure peace, and save the world from German economic dominance, it is indispensable that Alsace should again become French. The deposits of Stassfurt, and minor ones in Galicia, Spain, Italy, Tunis, the United States, and Chile, are noted, with some statistics of the production and consumption of potash. S. G. GORDON.

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**The occurrence of high-grade American clays** (RIES) 19.

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BURWASH, EDWARD M. J.: **Geology of Vancouver and Vicinity.** Chicago: University of Chicago Press. 106 pp. \$1.50.

DWERRYHOUSE, ARTHUR R.: **Geology.** New York: Frederick A. Stokes Co. 301 pp.

JOHANNSSEN, ALBERT: **Manual of Petrographic Methods.** 2nd Ed. New York, N. Y.: McGraw-Hill Book Co., Inc. 649 pp. \$6.00.

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## 9. METALLURGY AND METALLOGRAPHY.

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WILLIAM BRADY, WILLIAM T. HALL.

**The presidential address. (Recent progress in mining and metallurgy in South Africa.)** H. S. MEYER, President of the Chem., Metallurgical and Mining Soc. of S. Africa. *J. Chem. Met. Soc. S. Africa* 19, 33-7(1918). E. J. C.

**Feeding flotation oil in the Coeur d'Alenes.** C. T. RICE. *Eng. Mining J.* 106, 1022-3; cf. *C. A.* 12, 1281.—Methods are described of feeding oil so as to maintain a regular supply of the desired quantity and types of suitable app. are described and illustrated. E. J. C.

**Brier Hill Steel Co.'s new plate mill.** ANON. *Iron Age* 102, 1521-4(1918), illus. E. J. C.

**Pre-war Russian iron and steel plants.** ALEXANDER GOUVY. *Iron Age* 102, 1501-7(1918).—An illustrated discussion of the equipment and output and of prospects after the war. E. J. C.

**The prospects of the German iron industry.** HUGO STINNES. *Engineering* 106, 599(1918). E. J. C.

**The production of rolled zinc in the United States.** C. E. SIEBENTHAL. *Metal Ind.* 16, 556(1918).—Statistics. E. J. C.

**The Golden cyanide plant.** ANON. *Chem. Met. Eng.* 19, 796-7(1918).—Descriptive. Gold tellurides are treated. E. J. C.

**Communications from a lead-works.** D. A. LANDSBERG. *Metall u. Erz* 15, 27-8(1918).—The use of Zn to concentrate the Ag and Au occurring in a bath of Pb into a small quantity of alloy also effects the recovery of Pt and the Pt metals, of which traces occur sometimes in the treated ores. From the alloy obtained, Ag-Au-Pt, the Pt can be recovered after distn of the Zn. T. VERHEGGEN.

**Balanced reactions in steel manufacture.** ANDREW McCANCE. *Trans. Faraday Soc.* (advance copy), 11 pp.(1918).—The important reactions of steel making are re-

versible in nature and the laws developed by physico-chem. study of equilibrium conditions have an important bearing upon practical work. In this paper, an attempt is made to apply these principles to the theory of reactions that take place in the open-hearth furnace during the manufacture of steel. During the melting period, the higher the av. temp. the less oxidation of the scrap and less FeO in the slag. The dominant reaction during this period, and the one to be avoided, is  $3\text{FeO} + 4\text{H}_2\text{O} \rightleftharpoons \text{Fe}_3\text{O}_4 + 4\text{H}_2 + 38.5 \text{ cal.}$  The reaction, being exothermic, takes place less and less as the temp. is raised. The steam content of the combustion gases should be kept as low as possible. After melting, the liquid metal is covered with slag and during the boiling period, after the Si and Mn have been oxidized by the slag, the C in the original metal is oxidized by the FeO in the slag:  $\text{FeO} + \text{C} \rightleftharpoons \text{CO} + \text{Fe} - 35.6 \text{ cal.}$  The escape of the CO causes the boiling. The reaction takes place throughout the whole mass of metal. The *partition law* governs the distribution of the FeO between 2 solvents—molten metal and molten slag. As ore is added to the slag, FeO dissolves in the latter and is transferred to the metal in proportion as the FeO is used up by reaction with C. Toward the end of the operation, the addition of CaO lessens the soly. of FeO in the slag and thus forms a greater proportion of FeO being taken up by the metal. It would work unfavorably if CaO were added too soon, by lessening the supply of FeO. An increase of temp. from  $1550^\circ$  to  $1600^\circ$  reduces by more than by one-third the quantity of FeO dissolved in the molten metal and this is favorable toward the end of the boiling as it prevents slag inclusions in the finished steel. This effect is traced to the change in the equilibrium constant of the above reaction with rise of temp. As regards the reduction of Si from a highly siliceous slag, the reaction is accomplished by C rather than by Fe:  $\text{SiO}_2 + 2\text{C} \rightleftharpoons \text{Si} + 2\text{CO} - 122 \text{ cal.}$  The presence of CO in the molten metal entails a further reaction with FeO:  $\text{FeO} + \text{CO} \rightleftharpoons \text{Fe} + \text{CO}_2$ . A lowering of the temp. of working greatly decreases the ratio of  $\text{CO}:\text{CO}_2$  in the metal. If steel has a greater soly. for CO than for  $\text{CO}_2$  all the peculiarities in the relation of these gases and steel can be explained. If there is much FeO in soln., the ratio of  $\text{CO}_2:\text{CO}$  will be large and when the steel solidifies blow holes will form at the instant of solidification. At the finishing temp. the steel is satd. with CO.

W. T. H.

**Soldering and brazing.** P. W. BLAIR. *Metal Ind.* 16, 547-9(1918).—"A practical article."

E. J. C.

**Rapid recrystallization in deformed non-ferrous metals.** D. HANSON. *J. Inst. Metals* (advance copy), 5 pp.(1918); *Engineering* 106, 403-4(1918).—For these expts. a device adopted by Chappel has been used. A test piece tapered towards the center, after being annealed, is broken in tension. In this way varying degrees of deformation are obtained, the maximum at the point of fracture down to zero at a point between the fracture and shoulder. A tapered test piece of cold-rolled Al, 0.1 in. thick, was annealed at  $480^\circ$  and broken cold. One-half was then re-annealed at  $480^\circ$  and quenched in water. On etching with HF, remarkably coarse crystals were found where the strain was least and from this region the crystal size decreased to the point of fracture. At the shoulder where the piece was not strained, or at least not enough to cause recrystn., the original crystal size was found. The other half of the test piece was annealed for 5 min. at  $450^\circ$ . Coarse crystals developed, but for a smaller distance from the point of fracture, and there was the same variation in size as with the other half. The same phenomena were observed with Mg, Pb and Cu, and in alloys consisting of solid solns. as Cu-Zn-Al alloy, and 70:30 brass. Apparently the following law is applicable to all strained metals: For every degree of deformation there is a critical recrystallization temp. at which crystal growth is extremely rapid. The size of crystal thus produced is greater as the deformation is less. The rate of increase in size of newly formed

crystals with prolonged time and increased temp. of annealing is small compared with their rate of growth at the critical temp. W. T. H.

**Carbon in cast iron.** FRANK H. KINGDON. *Iron Age* 102, 1439(1918).—The rapid detn. of total C by direct combustion and of graphitic C after treatment of the metal with dil.  $\text{HNO}_3$  is described. The use of the pyrometer to control the temp. is advocated. E. E. RICHARDSON.

**Solders for aluminium.** PAUL D. MERICA AND LOUIS J. GUREVICH. *Metal Ind.* 16, 500-3(1918).—Al can be welded satisfactorily by the O-gas process. The solders for Al usually contain Zn, Sn and Al in various proportions and are applied to surfaces that have been cleaned and "tinned" by coating with a layer of solder rubbed into the hot surface. Fluxes may be used consisting of stearic acid, rosin,  $\text{ZnCl}_2$ , soap, sugar, or mixtures of these substances. Data are given showing tests of the strength, ductility and electrolytic behavior of various solders. All metals or combinations of metals suitable for soldering Al are electro-negative to Al and as a result soldered joints are prone to attack when exposed to moisture. They should be protected, therefore, by paint or varnish. It is advisable to solder without using any flux. The higher the temp. at which the tinning is done, the better is the adhesion of the tinned layer. E. E. RICHARDSON.

**Monel metal.** JOHN ARNOTT. *Engineering* 106, 451(1918).—Monel metal consists of Ni and Cu, with small amts. of Mn, Fe and Si, all present in solid soln. For microscopic study, polished sections may be etched with alc. +  $\text{FeCl}_3$  or with  $(\text{NH}_4)_2\text{SO}_4$  soln. The physical properties are described. E. E. RICHARDSON.

**The properties of metals as affected by their occluded gases.** COSMO JOHNS. *Trans. Faraday Soc.* (advance copy), 4 pp.(1918).—A review and bibliography of this subject is given. W. T. H.

**Theories of occlusion and the adsorption of iodine by carbon.** JAMES WILLIAM MCBAIN. *Trans. Faraday Soc.* (advance copy), 10 pp.(1918).—True adsorption is nearly instantaneous. Absorption, or solid soln., may be expected to follow Frick's law, which requires a high velocity at first but a rapid falling off in rate with time until equilibrium is produced. In many cases adsorption and absorption both take place. Attention is called to Langmuir's hypothetical explanation and well crystallized views. Expt. on the sorption of iodine by C, extending over exposure periods of 5 min. to 11 yrs. show a rapid surface condensation at first, followed by a very slow and long-continued diffusion which eventually involves more than half of the iodine sorbed. A bibliography is appended. W. T. H.

**The occlusion of gases in metals.** HENRY A. KENT. *Trans. Faraday Soc.* (advance copy), 2 pp.(1918).—General statements. W. T. H.

**General remarks on occlusion of gases in metals.** ALFRED W. PORTER. *Trans. Faraday Soc.* (advance copy), 6 pp.(1918). W. T. H.

**Gases occluded in steel.** THOMAS BAKER. *Trans. Faraday Soc.* (advance copy), 32 pp.—Some years ago B. attempted to discover whether a relation exists between the temp. at which gas is evolved from steel and the critical points of the latter. With hard steels the evolution of hydrogen reached a maximum rate at  $600^\circ$  and the greater part of the gas was evolved at lower temps. CO began to be evolved from the beginning of the expt. but reached its maximum rate at  $688^\circ$ . The quantities of  $\text{CO}_2$ ,  $\text{CH}_4$  and N obtained were very small compared with H and CO, which were evolved in approximately equal amts. Also in *Engineering* 106, 572(1918). W. T. H.

**Grain growth in metals.** ZAY JEFFRIES. *J. Inst. Metals* (advance copy), 32 pp.; *Engineering* 106, 356-60(1918).—This paper represents the first part of a thesis submitted for the degree of Doctor of Sciences at Harvard Univ. The subjects discussed

are: grain growth in the solid state; normal grain growth in metals; exaggerated or abnormal grain growth; general laws of grain growth; typical examples of grain growth; grain growth in cast metals; macro-mechanism of grain growth; micro-mechanism of grain growth; effect of thickness on grain growth; small grains included within large grains. The original paper must be consulted for details. W. T. H.

**Steel castings for ordnance purposes.** Ordnance steel for the army and navy. JOHN HOWE HALL. *Iron Age* 102, 1084-6(1918).—The tests which have to be met with steels furnished the army and navy are given and the specifications are compared with those adopted by the Am. Soc. for Testing Materials and with those of Lloyd's Register. To meet some of these specifications special care must be taken to have the steel thoroughly deoxidized and quiet in the ladle so that it will set sound in the castings and test bars. As much, or more, care should be taken in molding and pouring the test bars as is taken with the castings. Very careful heat treatment must be given the castings. W. T. H.

**Meeting specifications for ordnance purposes.** E. R. SWANSON. *Iron Age* 102, 1086-7(1918).—The specifications for the 3 principal grades of steel furnished the army are now the same as those of the Am. Soc. of Testing Materials as regards the physical properties and the chem. requirements are the same except as regards S. The importance of chem. control and of proper heat treatment is emphasized. W. T. H.

**The heterogeneity of steel.** H. LECHATELIER AND B. BOGITCH. *Compt. rend.* 167, 472-7(1918).—Etching a polished specimen of commercial steel with Stead's reagent, with dil.  $H_2SO_4$  or with I, produces macroscopic evidence of heterogeneity at the surface of the material. This macroscopic etching effect is entirely different from the etching effect which under the microscope reveals the structure of the steel but the quality of the steel can be judged to a certain degree by the macroscopic etching. Just what causes this grosser effect has not been known. Stead assumed that it was in some way related to the P content but this has been disproved by the fact that similar macroscopic etching has been obtained with steel extremely low in P. The expts. now described, which took place with electrolytic Fe quickly, melted with and without addition of oxide, seem to show that the effect is caused by O held in solid soln. by Fe. The effect is lost if the specimen is heated in H. Steel taken from the Martin furnace before treatment with Mn does not show a macroscopic etching effect but steel which has been partially deoxidized does show it. Moreover, the presence of O in solid soln. may explain the fact, noted by Mahler, that the elec. resistance of steel can be computed from the resistivities of each foreign element present if the test is made after the steel has been fully deoxidized but not if made before the final addition of Mn. W. T. H.

**Electrical resistance of hardened steel.** E. D. CAMPBELL. *Engineering* 106, 509(1918).—Steel bars were heated and quenched, and the specific resistances were detd. They were then kept between 100 and 108° and the sp. resistances were detd. at intervals during 12 hrs. A similar set of bars after quenching was kept under oil at room temp. and the sp. resistances were detd. at intervals during 2 years. The change in elec. resistance after 2 years at ordinary temps. was found to be only 35-40% of what it was after 12 hrs. at 100°. S. G. SIMPSON.

**Substitution of niter cake for sulfuric acid in pickling steel.** EDWIN E. CORBETT. *Bur. of Mines*, Oct., 1918, 17 pp.—The substitution of niter cake for  $H_2SO_4$  in pickling steel is advocated in order to conserve materials. Methods of using the cake are discussed and practical questions such as those of shipping and storage as well as expense are considered. From 10 to 20% saving in expense is claimed. An attempt is made to explain the theory of pickling particularly in regard to the effect of  $FeSO_4$ ,  $Na_2SO_4$ ,  $Fe_2(SO_4)_3$ , and various inhibitory agents. W. T. H.

**Inspection of steel arc welds.** O. S. ESCHOLZ. *Iron Age* 102, 1390-1 (1918).—The factors detg. the character of welded joints and methods of testing welds are discussed, with special emphasis placed upon penetration tests and electrical tests. W. T. H.

**Factors in the manufacture of high-grade malleable castings.** J. G. GARRARD. *Iron Age* 102, 1455 (1918).—The art of making heavy castings is discussed. W. T. H.

**The manufacture of semi-steel shells.** ANON. *Iron Age* 102, 1317-21 (1918).—An account of the operations for making semi-steel shell as prepared by the Ordnance Dept. to guide manufacturers. The chem. requirements are stated. W. T. H.

**Black finishes on iron and steel.** ELMER S. WHITTIER. *Metal Ind.* 16, 509-10 (1918).—Processes which are suitable for commercial operations on a large scale are discussed. W. T. H.

**Helical and elliptical springs.** CHAUNCEY T. EDGERTON. *Chem. Met. Eng.* 19, 762-7 (1918).—The manuf. of elliptical and coil springs, the types of steel alloys used, the formulas for calculating the loads, deflections and torsion, the effects of overstrain, and molecular hysteresis are discussed. W. T. H.

**Aluminium and its light alloys.** VI. Bibliography. PAUL D. MERICA. *Chem. Met. Eng.* 19, 729-32, 780-5 (1918); cf. *C. A.* 12, 2532. W. T. H.

**A case of disintegration of a copper-aluminium alloy.** RICHARD SELIGMAN AND PERCY WILLIAMS. *J. Inst. Metals* (advance copy), 2 pp. (1918).—Some wires which had been used for several years to support thin slabs of gelatin showed unusual disintegration. Examination of the corroded material showed that the trouble was due partly to the fact that the wires had been severely overdrawn but chiefly to the presence of 2.65% Cu. W. T. H.

**The alloys of copper and zinc: an investigation of some of their mechanical properties.** F. JOHNSON. *J. Inst. Metals* (advance copy), 6 pp. (1918).—The theory of Kurnakow and Zemczuzny, which forms the basis of work by Turner and Murray, calls for a maximum hardness of the alpha solid soln. at a point midway between the phase boundaries of the equilibrium diagram. In the present work this theory was disproved: a range of uniform hardness was obtained with alloys containing 90 to 70% Cu, but there was no evidence of a pronounced maximum. The hardness curve at the Zn end of the diagram changes its direction twice, (1) at about 5% and (2) at about 15% Cu; but no sudden fall followed by a sharp rise was noted, as indicated by Turner and Murray for sand castings. Alloys consisting entirely of beta solid soln. are stronger than alloys containing either the alpha or gamma soln. in excess. In fact the wholly beta solid soln. (53% Cu) has better mechanical properties than have been attributed to it by former investigators. The Brinell hardness of this alloy was 18.0 as cast and 14.3 when annealed. Its yield point was 10.5 tons per sq. in., its ultimate strength 30.4 tons per sq. in. and the elongation 37.5%. The duplex ( $\alpha + \beta$ ) brasses and the  $\beta$  brass were found to be much more ductile than other investigators have indicated. Two alloys near the Zn end of the series have mechanical properties which do not appear to be appreciated. The alloy with 3.45% Cu has a yield point of 7 tons per sq. in., an ultimate breaking stress of 9.6 tons and elongation of 5%. The other alloy contains 8.8% Cu., shows the same elongation but is about 60% stronger. W. T. H.

**Pure carbon-free manganese and manganese-copper.** ARTHUR F. BRAID. *Bull. Am. Inst. Mining Eng.* 1918, 1697-8, 1783; *Metal Ind.* 16, 357-8 (1918).—Mn in the form of an alloy containing 30% Mn and 70% Cu has been used successfully as a de-oxidizer in casting Ni alloys for drawing purposes. The alloy also removes S. W. T. H.

**Alloys of silicon and their high electrical conductivity.** JAMES SCOTT. *Metal. Ind.* 16, 464-5(1918).—Si-bronze, owing to its high elec. conductivity, is used extensively for telephone and telegraph wires. But little Si is present in the finished alloy as this element acts chiefly as a deoxidizer. The microscopic appearance of pure Si and of the 15% alloy with Cu are described. W. T. H.

**The influence of hot work on the mechanical properties of steel.** G. CHARPY. *Rev. métal.* 15, 427-48(1918); cf. C. A. 12, 2527.—The expts. referred to in the previous abstract are here described in full. W. T. H.

**Researches on alloys rich in zinc.** LEON GUILLET AND VICTOR BERNARD. *Rev. métal.* 15, 407-25(1918).—Alloys containing 88 to 99% Zn, 0 to 5% Al and 0 to 8% Cu were studied as regards hardness, resistance to shock and best temp. of forging, to see if any of these alloys could replace commercial Cu alloys. An alloy contg. 90% Zn and 2% Al, also one contg. 88% Zn, 4% Cu and 8% Al appear to be promising. All the results on some 20 alloys are tabulated. W. T. H.

**A study of cementite transformation and of the equilibrium diagram of the system iron-carbon by means of electric resistance measurements.** IITIRO IITAKA. *Sci. Rep. Tôhoku Imp. Univ.* 7, 167-75(1918).—A marked change in elec. resistance of Fe and steel has been found to take place at the temp. of the  $A_1$ ,  $A_2$  and  $A_3$  transformations and it has been shown that the Fe-C equilibrium diagram can be studied by means of elec. resistance measurements with practically the same results as have been obtained by the study of heating and cooling curves. The  $A_0$  critical point have been detected by means of magnetic observations. The purpose of the present work was to detect this  $A_0$  point by means of resistance measurements and to measure in the same way the so-called S-E line in the Fe-C diagram along which  $Fe_3C$  separates from solid soln. on cooling. By means of an improved differential method, the  $A_0$  point was detected in 6 steels of widely varying C content at 195-212° on heating and at 192°-200° on cooling. These values are a little lower than the temp. detd. magnetically (215°) but agree closely with those obtained by thermic methods. The S-E line was detd. with 10 steels containing 0 to 1.30% C. The values agree well with those already detd. by thermic methods and here also the points detd. with rising temp. were a little higher than with falling temp. It is interesting to note that the  $A_2$  points were detected in the hypereutectoid steels. W. T. H.

**Substituting manganese for phosphorus.** A. F. BRAID. *Foundry* 47, 17(1919).—The use of Mn as a deoxidizer in the production of non-ferrous alloys is discussed. W. T. H.

**Malleable iron in engineering construction.** H. A. SCHWARTZ. *Foundry* 147, 19-24(1919).—The physical properties are discussed in the hope of overcoming objections that are often made by engineers who are not favorable to the use of malleable Fe. W. T. H.

**Metallic electrode arc welding.** O. S. ESCHOLZ. *Eng. Mining J.* 106, 1081-3(1918).—The advantage of electric arc welding over other methods are outlined and methods described for detg. the physical characteristics of welds. W. T. H.

**Steel wool.** GEORGE P. BUTLER. *Metal Ind.* 16, 549(1918).—The use of steel wool for cleaning metals and glass is favored. W. T. H.

**The welding of iron and steel.** W. H. CATHCART. *Iron Age* 102, 1578-82(1918).—The principles underlying the work at the smithy and forge, the effect of oxidation, the use of a flux, the reason that annealing is essential and the desired conditions to be fulfilled are discussed. Photographs are reproduced to show the way in which the scientist can coöperate with the craftsman. W. T. H.

**Nomenclature for electric welding.** H. G. KNOX. *Engineering* 106, 522-6 (1918), illus. E. J. C.

**The relative corrosion of cast-iron, wrought-iron, and steel pipe in house drainage systems.** WM. PAUL GERHARD. *J. Am. Soc. Mech. Eng.* 40, 945-7(1918).—Results of investigation of drainage and vent systems of 78 buildings showed wrought-iron pipe to be more durable for house drains than steel pipe, and steel pipe to be inferior to both cast-iron and wrought-iron pipe when exposed to corrosion. Two forms of corrosion were observed—pitting, and flaking or scaling. The former was characteristic of wrought-iron and cast-iron pipes; the latter was typical of steel pipes. Steel vents in service more than 20 years showed in nearly all cases a very bad deterioration. Also in *J. Franklin Inst.* 187, 99-109(1919). S. G. SIMPSON.

**Hardness testing.** A. F. SHORE AND ROBERT HADFIELD. *Iron and Steel Inst.*, Sept. 12, 1918; *Engineering* 106, 444-70(1918).—From the Hadfield Research Lab. in Sheffield the following questions were sent to S. of New York: (1) Is it possible to find the relation between ball hardness, commencing with 150 up to 800, and scleroscope degrees? Also, for each advance of, say, 50 Brinell nos. what is the difference in scleroscope nos., and what is the necessary factor to convert each of these from Brinell into scleroscope nos., and *vice versa*. (2) Can a special scleroscope be supplied for detg. in Brinell nos. instead of scleroscope, or both, highly hardened products ranging from 550 to 750 Brinell ball? S. has undertaken an elaborate series of expts. to answer these questions and the results are shown graphically in charts. Commenting on these results, H. draws the following conclusions: Chart I shows the statements S. makes with regard to correlating scleroscope and Brinell tests, the latter carried out with 3000 kg. pressure. He shows that there is no very definite relation on these lines, which is in line with common experience. (3) The trouble lies in the way the Brinell test is usually carried out, *i. e.*, with a standard pressure of 3,000 kg. The Brinell test should be carried out so as to give the same size impression on every material. (4) The reason this gives better values is that each piece is then deformed equally. (5) S. argues that his scleroscope test does not much exceed the elastic limit of the material and, therefore, is a guide to elastic limit, whereas the ordinary Brinell test is more of a guide to the tenacity. (6) By reducing the pressure in the Brinell test, better correlation is obtained. This comment is shown to be justified by Chart III. (7) As comment to the above, Chart I, imperfect as it is, is really the best way for comparing scleroscope and Brinell. (8) Chart II shows how scleroscope and Brinell compare when the latter test is made on ideal lines. (9) The use of a diamond ball apparently overcomes the difficulty arising from the deformation of steel balls. It is the best device yet put forward in competition for the Hadfield prize. (10) The difficulty in applying a modification to the Brinell test arises from the fact that different values will be obtained from those now in use the world over. W. T. H.

**The value of the indentation method in the determination of hardness.** R. G. C. BATSON. *Inst. Mech. Eng.*, Oct. 18, 1918; *Engineering* 106, 475-7(1918).—The indentation method for detg. hardness is applied by producing the indentation by a static load or by a blow. A series of tests by both methods was made on mild steel, boiler plate, rail steel, high-C steel and cast Fe. By means of the former method it is shown that a hardness no. can be obtained by using Moore's formula, based on Meyer's conclusion that the mean pressure per unit area is constant for a given angle of impression whatever the diam. of the ball. The hardness no. can be obtained, independently of the load, by calculating it from the slope of the "load-depth of indentation" diagram when this diagram becomes straight. By means of the dynamic method results were obtained showing: (a) The energy of the blow is proportional to the vol. of indentation for both cone and ball indenting tools and the dynamic hardness no. (as applied



by Martel to the cone) is equal to the energy of the blow in kg. divided by the vol. of indentation in cu. cm. (b) The energy of the blow is proportional to the square of the spherical area of indentation for ball indenting tools only (Roos). (c) The vol. of indentation (and therefore the dynamic hardness no.) is approx. independent of the form of indenting tool, whether a cone, a 10-cm. ball or a 4.76-mm. ball. W. T. H.

**The Ludwik hardness test.** W. CAWTHORNE UNWIN. *Inst. Mech. Eng.*, Oct. 18, 1918; *Engineering* 106, 478(1918).—The paper is intended to trace a relationship between indentation hardness tests of ductile metals. The variation of the hardness no. in the Brinell test with the load and size of ball arises from the fact that the indentations are geometrically dissimilar. P. Ludwik has sought to overcome this defect by using a right-angled cone for the indenting tool. The Ludwik apparatus manufactured in Sweden and in Switzerland is used specially for the softer metals but the results vary widely from those obtained by the Brinell method. The Brinell no. is found by dividing the load by the spherical area of the indentation. Just why the spherical area was taken as divisor is not quite clear unless to compensate some increase of hardness no. when the indentation was deep, due to hammer hardening of the material. A better way would be to limit the depth of indentation and define the Brinell no. as  $H = P_b/\pi a_b^2$ , where  $P_b$  is the load in kg., and  $a_b$  the radius of the indentation in mm. Making a similar correction of the Ludwik test the hardness no. is  $L = P_c/\pi a_c^2$ . These 2 values are shown to be concordant. It is suggested that in standardizing the tests the loads should be varied until the vol. of indentation is practically constant.

W. T. H.

**Hardness testing.** GERALD STONEY, *et al.* *Engineering* 106, 469-72.—A discussion of the 2 foregoing papers and that of Edwards and Willis (*J. Inst. Mech. Eng.*, May, 1918; cf. C. A., 12, 2521).

W. T. H.

**The wear of metals.** ANON. *Engineering* 106, 625-9(1918).—A synopsis of ideas on this subject starting with views of C. B. Dudley published in 1890. Finally, results obtained by Guest, Keen and Nettlefolds on a 95-lb. bull-head rail which had been given the Sandberg treatment are described. The results show that the Sandberg sorbitic process greatly increases the tensile breaking strength of the steel and the elongation under stress is decreased to a marked degree. The Brinell hardness is much higher in the treated rail at the top of the head, which is the part most subject to wear. The Messrs. Sandberg presented the process, free of royalty, to the British govt. for use on munitions of war and, after exhaustive tests, it was adopted for reclaiming high-explosive steel which had failed to fulfil the specifications. Photomicrographs are shown which illustrate the effect of the Sandberg treatment.

W. T. H.

**Hardness of soft iron and copper compared.** F. C. KELLEY. *Trans. Am. Electrochem. Soc.* 34 (Preprint)(1918).—Samples of American "ingot iron" and commercial cold-rolled Cu were similarly treated in an elec. heated vacuum furnace and the hardness was carefully detd. by the standard Brinell method. Annealing temps. were 770-950°. Treatment lasted several hrs., followed by annealing in H or *in vacuo*. The range of hardness between dead-soft Cu and commercial Cu is 40 and 80, and the range between H-annealed ingot Fe and the commercial material ranges between 60 and 95. Dead soft Fe may be whittled with a knife and in some cases replace pure soft Cu.

W. H. BOYNTON.

**The constitution of the tin bronzes.** SAMUEL L. HOYT. *Univ. Minn. Bull. Am. Inst. Mining Eng.* 1918, 1721-7.—Alloys of Cu with considerable Sn and less Zn showed marked thermal effects at 520° and 600°. A bar of alloy containing 75% Cu, 15% Sn and 10% Zn was heated to 700° and then by partial removal from the furnace, one end of the bar was cooled to about 400° and after being kept in this condition for

8 hrs. the bar was suddenly quenched. One side of the bar was then ground, polished and etched. At the high temperature, the sand modifications were present. At a somewhat lower temp. a third constituent was formed and at a still lower temp. a fourth phase was proved to exist. The exact significance of these 2 new phases and the critical temps. of  $520^{\circ}$  and  $600^{\circ}$  is not yet clear. W. T. H.

**Bronze bearing metals.** G. H. CLAMER. *Bull. Am. Inst. Mining Eng.* 1918, 1729-33.—The useful bearing alloy containing Cu, Sn, and Pb, with or without a little P, is described and the desirable properties of good bearing metal discussed.

W. T. H.

**The aluminium bronze industry.** W. M. CORSE. *Bull. Am. Inst. Mining Eng.* 1918, 1738-42.—The equil. diagrams of Cu-Sn alloys and of Cu-Al alloys are given and the physical properties of Al-bronze are compared with those of Sn-bronze.

W. T. H.

**Bronzes, bearing metals and solders.** C. K. BURGESS AND R. W. WOODWARD. *Bull. Am. Inst. Mining Eng.* 1918, 1142-50.—The chem. compn. and physical properties of bearing metals, bronzes and solder are discussed with particular reference to the conservation of tin.

W. T. H.

**Babbitts and solder.** G. W. THOMPSON. *Bull. Am. Inst. Mining Eng.* 1918, 1751-2.—A general discussion.

W. T. H.

**The cadmium resources of the United States.** C. E. SIEBENTHAL. *Bull. Am. Inst. Mining Eng.* 1918, 1752-9.

W. T. H.

**The metallography of tungsten.** ZAY JEFFRIES. *Bull. Am. Inst. Mining Eng.* 1918, 1641-9, 1779-82; cf. *C. A.* 12, 1637.—An interesting discussion of J.'s paper by Paul D. Merica and by J. C. W. Humfrey, to which J. makes careful reply.

W. T. H.

**The relation of sulfur to the overpoling of copper.** S. SKOWRONSKI. *Bull. Am. Inst. Mining Eng.* 1918, 1637-8; cf. *C. A.* 12, 1269.—F. Johnson suggests that the favorable effect of O may have been due to generation of  $H_2O$  or  $CO_2$  as a result of chemical reaction and the tendency of these gases to escape has acted in opposition to the natural tendency of the ingot to shrink.

W. T. H.

**A metallographic investigation of transverse-fissure rails with special reference to high phosphorus streaks.** G. F. COMSTOCK. *Bull. Am. Inst. Mining Eng.* 1918, 1699-1744.—Careful examination of polished sections etched with  $CuCl_2$  from a great many rails in which transverse fissures have developed show that segregated S does not seem to be the main cause of trouble but rather the segregation of P as shown by the presence of high-P streaks at points where the flaws started. By reheating the blooms from which rails are to be rolled, the P-bands are eliminated more or less completely and the tendency to form transverse fissures is diminished.

W. T. H.

**Experiments in annealing malleable iron.** H. E. DILLER. *Foundry* 46, 564-6 (1918).—The theory of making malleable castings from brittle cast Fe is discussed and expts. are described which aim to det. the best conditions for carrying out the process on a commercial scale. The use of a tunnel furnace is advocated by the aid of which castings can be obtained ready for shipment in 72 hrs. from the time the heat is poured. For the conversion of combined C into temper C, the use of packings or of oxidizing atm. seem to have little effect.

W. T. H.

**Continuous tunnel furnace in the malleable-iron industry.** PHILIP D'H. DRESSLER. *Foundry* 46, 560-8 (1918).—The results of the expts. of Diller (preceding abstract) are discussed and the construction of the tunnel furnace is described in detail.

W. T. H.

**Annealing cold-rolled aluminium sheet.** ROBERT J. ANDERSON. *Inst. Metals*, Sept. 11, 1918; *Engineering* 106, 388-90 (1918).—See *C. A.* 12, 1759.

W. T. H.

**The cooling of steel in ingot and other forms.** J. E. FLETCHER. *Iron and Steel Inst.*, Sept. 13, 1918; *Engineering* 106, 342-4, 371-4, 418-9 (1918).—The contraction of ingots during cooling, with the formation of "pipe," the effect of variable speeds of cooling and the influence of cooling on the cryst. structure are discussed very carefully. Considerable data are given and photomicrographs shown. W. T. H.

**Dry-gas producer (BRAÜTIGAM) 21.** Constitution and thermal stability of carbides (RUFF, *et al*) 6.

BREARLEY, A. W., AND BREARLEY, HARRY: **Ingot and Ingot Molds.** London: Longmans, Green & Co. 233 pp. 16s.

BROEMEL, L., AND DAUGHERTY, J. S.: **Sheet Metal Workers' Manual.** Chicago: F. J. Drake & Co. 552 pp. \$2.00.

BROOK, JOHN: **French Measure and English Equivalents.** For use of manufacturers in iron, steel, etc. New York: Spon & Chamberlain. 80 pp.

DAUGHERTY, J. S.: **Essentials of Sheet Metal Work.** Chicago: F. J. Drake & Co. 181 pp. \$1.50.

ESCARD, J.: **L'aluminium dans l'industrie.** Paris: Dunod et Pinat. 272 pp. 14 fr. 40.

GRANJON, R., AND ROSENBERG: **Manuel pratique de soudure autogene.** Paris: Union de la Soudure Autogene. 379 pp. 7 fr. 50.

JACQUET, A.: **Aciers, fers, fontes.** Vol. I. Paris: Dunod et Pinat. 197 pp. 7 fr. 20.

LOYD, GEORGE C., LOUIS, HENRY, AND BROCK, REGINALD W.: **Report on the Sources and Production of Iron and other Metalliferous Ores used in the Iron and Steel Industry.** Revised and enlarged edition of "Resources and Production of Iron Ores, and other Principal Metalliferous Ores used in the Iron and Steel Industry of the United Kingdom." London, England: H. M. Stationery Office. Darling & Son, Ltd. 180 pp.

MOCK AND BLUM: **Abridgment of U. S., British and German Patents on Alloys, Covering the Production of Platinum Substitutes Including Alloys Having Certain of the Properties of Platinum.** New York: Mock & Blum. 319 pp.

TURNER, THOMAS: **Metallurgy of Iron.** 5th Ed. Revised and enlarged. London: Charles Griffin & Co. 451 pp. 18s.

WALSH, J. J.: **Physics and Chemistry of Mining and Mine Ventilation.** 2nd Ed. Revised and enlarged. New York: D. Van Nostrand & Co. 219 pp. \$2.00.

**Gold-concentration apparatus.** A. R. MACKIE. U. S. 1,286,185, Nov. 26.

**Apparatus for separating minerals by flotation.** F. D. S. ROBERTSON. U. S. 1,286,111, Nov. 26.

**Ore-concentrating apparatus.** J. M. STADEL. U. S. 1,286,136, Nov. 26. Sepn. is effected by oil and H<sub>2</sub>O.

**Apparatus for separating minerals by flotation.** A. C. DAMAN. U. S. 1,285,061, Nov. 19.

**Treating ores.** J. G. AARTS and C. J. G. AARTS. Brit. 119,867, Sept. 28, 1918. Sulfide ores are sulfated by roasting the ore, mixed with an Fe compd. or other catalyst if sufficient Fe is not originally present, at above 800°, and afterwards exposing the product to the action of the roast gases. The temp. may be diminished, *e. g.*, from 800°

to 500°, while the roast gases and the ore are moved in the same direction. Ores having a low % of S may be mixed with S or pyrites before roasting. Oxide or other ores containing no S may be heated with a gas containing SO<sub>2</sub> and O, with the addition of a catalyst if necessary. In some cases, the sulfatizing may be stopped at such a temp. that sulfates of only certain of the metals present are formed. Ores of Zn, Cu, Ni, Ag, Cd, Co and Mn are mentioned.

**Metallurgical (crucible) furnace.** B. ZOBEL. U. S. 1,285,883, Nov. 26. The furnace is adapted for prepg. brass, bronze or similar alloys.

**Refining lead.** P. WERNER. U. S. 1,285,511, Nov. 19. Molten Pb is refined (preliminary to its use for coating Fe or steel) by treatment with the products of the destructive distn. of rosin, resinous wood or other resinous material while the surface of the molten metals is protected from the air.

**Lead bullion.** G. P. HULST. U. S. 1,285,714, Nov. 26. Decopperized Pb bullion is subjected to the action of oxidizing agents such as skims containing Pb oxides to oxidize impurities and form a slag or skim, the latter is removed and the softened bullion is treated with Zn to effect desilverization, the impurities in the desilverized Pb are oxidized and the "refiner skim" produced in this last-mentioned operation is added to the charge which has been subjected to the softening treatment, together with "molding skim" resulting from molding of the refined Pb. The desilverized Pb is drossed of Cu skim and the final Zn skim is retorted to obtain Zn, "blue powder," bullion and dross.

**Core mixture for founding.** D. J. REILY and A. DE MATTEI. U. S. 1,286,106, Nov. 26. A mixt. of yellow clay 25 and sand 75% is used for making cores for casting metals. This mixt. requires no org. binder.

**Core mixture for use in metal founding.** J. P. ELLIOTT. U. S. 1,285,081, Nov. 19. Cores for use in casting metals are formed by mixing comminuted asphalt with a body material such as core sand and with a temporary binder such as flour paste. The mixt. is then heated sufficiently to melt the asphalt.

**Steel rail.** R. A. LEWIS, W. R. SHIMER and W. J. THOMAS. U. S. 1,285,749, Nov. 26. A steel rail is finished, *e. g.*, by the method of U. S. pat. 1,285,748, so that it has a microstructure of fine granular pearlite almost free from free ferrite, being formed with a compn. including C 0.60-0.90%, Mn 0.50-1.0% and with S, Si and P in the usual amts. as found in open-hearth rail steel. The rail has a tensile strength of over 115,000 lbs. per sq. in., an elastic limit of over 70,000 lbs. per sq. in., an elongation of over 15%, a reduction in area of over 30% and a hardness of the Brinell test of over 225.

**Heat-treating steel rails.** R. A. LEWIS, W. R. SHIMER and W. J. THOMAS. U. S. 1,285,748, Nov. 26. Highly heated rails as they come from the final forming operation are cooled quickly to 540-700°, conveyed to a heating furnace and therein heated to a uniform temp. of 760-815°, then cooled rapidly to 315-540° and subsequently passed through an annealing furnace wherein the rail is uniformly heated to 540-650°. This treatment produces a hard tough structure.

**Apparatus for heat-treating steel rails.** R. A. LEWIS and W. J. THOMAS. U. S. 1,285,750, Nov. 26.

**Device for quenching steel artillery-shells.** T. F. BAILY and F. T. COPE. U. S. 1,285,583, Nov. 26.

**Treating oxidized ores.** F. A. EUSTIS. Can., 185,443, July 9, 1918. Oxidized Fe ores containing one or more of the metals Ni, Co, Al or Mn are heated in the presence of and intimately mixed with an excess of SO<sub>2</sub>, thus rendering a large amount of the metals sol. The material is then leached and the Fe pptd.

**Bearing metals.** W. H. KELLY. Can. 187,991, Dec. 24, 1918. Bearing metals of Pb and Cu are made by first purifying the Pb by subjecting it while in a molten condition to the action of H and O, then mixing the Pb with pure Cu.

**Case-hardening material.** L. C. MUNN. U. S. 1,286,061, Nov. 26. A material for use in case-hardening Fe or steel is produced by impregnating charcoal with a soln. of Ba(OH)<sub>2</sub> or other Ba compd. and then pptg. BaCO<sub>3</sub> in the pores of the charcoal by the action of CO<sub>2</sub>.

**Apparatus and method for annealing wire electrically.** H. ALEXANDER, W. T. VINT and A. IMBERRY. U. S. 1,285,887, Nov. 26.

**Copper-lead alloy.** G. P. KLING. U. S. 1,285,231, Nov. 19. An alloy of Cu 80 with Pb 20 parts containing about 1-2% of P is prepd. for use in piston-rod packings of steam engines.

**Soldering.** H. C. PROCTER. Brit. 119,688, Oct. 8, 1917. A soldering paste for Al consists of 75% powdered resin, 20% vaseline, and 5% ammonia.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROULLER.

The synthetic organic chemical industry. FRANCIS H. CARR. *J. Soc. Chem. Ind.* 37, 425-82 (1918).—An address. E. J. C.

**Zirconyl basic benzoates and salicylates.** F. P. VENABLE AND F. R. BLAYLOCK. *J. Am. Chem. Soc.* 40, 1746-8 (1918).—In hot solns. BzOH and acid or neutral ZrOCl<sub>2</sub> form a white, gelatinous ppt. which settles easily and can be readily washed and filtered; it is sol. in NH<sub>4</sub>OH, can be dried to fairly const. wt. at 100° but continues to lose wt. if heated beyond that temp. or if kept over CaCl<sub>2</sub>. Analysis of different preps. indicates that under varying conditions as to concn., etc., no single definite compd. is formed, the ppts. containing varying ratios of the BzO radical to partly dehydrated Zr hydroxide; the values found agree approximately with such formulas as ZrO(OH)<sub>2</sub>.2ZrO(OBz)<sub>2</sub>.6H<sub>2</sub>O, ZrO(OH)<sub>2</sub>.6ZrO(OBz)<sub>2</sub>.6H<sub>2</sub>O and ZrO(OH)<sub>2</sub>.3ZrO(OBz)<sub>2</sub>.16H<sub>2</sub>O. In the case of salicylic acid there seems to be a tendency to the formation of only 1 compd., 2ZrO(OH)<sub>2</sub>.3ZrO(C<sub>7</sub>H<sub>4</sub>O<sub>2</sub>)<sub>2</sub>, with varying amts. of H<sub>2</sub>O. The salicylates are more sensitive to heat than the benzoates, turning brown at 100° and black at 160°. C. A. R.

Chemical nomenclature (CRANE) 2.

MARTIN, GEOFFREY: *Industrial and Manufacturing Chemistry. I. Organic.* 4th Ed. Revized and enlarged. London: Crosby, Lockwood & Son. 764 pp. 36s.

**Chlorinating organic compounds by the aid of light.** W. O. SNELLING. U. S. 1,285,823, Nov. 26. In chlorinating CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>2</sub> or similarly acting compds., a mixt. of Cl with the material to be chlorinated is passed back and forth between transparent baffle plates placed in staggered relation to each other in the chlorination chamber, in such manner that the mixt. travels progressively toward the source of light and the light travels progressively in counter-current first through a mixt. rich in Cl and then to the fresh mixt. containing an increasing proportion of material to be chlorinated. See also U. S. pat. 1,271,790; C. A. 12, 1847.

**Gulonic lactone.** F. B. LAFORGE. U. S. 1,285,248, Nov. 19. Gulonic lactone is made by reacting with HCN upon xylose in aqueous soln., adding  $H_2SO_4$  in sufficient amt. to neutralize the  $NH_4OH$  formed in the reaction and to convert the Na compds. present into  $NaHSO_4$ , evapg. *in vacuo*, allowing the gulonic lactone to crystallize on standing, sepg. the crystals and washing them with cold  $H_2O$ . The pat. is dedicated to the public for free use. The HCN is produced *in situ* from NaCN and  $H_2SO_4$ .

**Phthalic anhydride, phthalic acid, benzoic acid and naphthoquinones from naphthalene.** H. D. GIBBS and C. CONOVER. U. S. 1,285,117, Nov. 19. Phthalic anhydride, phthalic acid, benzoic acid and naphthoquinones are produced by passing  $C_{10}H_8$  vapors mixed with air over a catalytic mass containing V oxides, preferably at a temp. of about  $500^\circ$ . The pat. is dedicated to the public for free employment of the process. Cf. C. A. 11, 134.

**The sulfonation of aromatic hydrocarbons or their derivatives.** H. BULL. Can. 187,834, Dec. 10, 1918. The substance to be sulfonated and  $H_2SO_4$  are caused to react on each other in the presence of a solvent in which the said substance and the sulfonated product are sol. but the  $H_2SO_4$  is not appreciably sol. and the product extd. in the solvent is withdrawn.

***p*-Nitrotoluene-*o*-sulfonic acid.** VARITEOLLISUUS OSAKEYHTIÖ. Dan. 23,344, Aug. 5, 1918. *p*-Cymene is sulfonated and to the product is added  $HNO_3$ , at a temp. of  $40-60^\circ$ , or a mixt. of  $HNO_3$  and  $H_2SO_4$  or K or Na sulfate, at a temp. of  $60-70^\circ$ .

**Methyl alcohol from methyl chloride.** B. S. LACY. Holl. 2,581, Sept. 5, 1918.  $CH_3Cl$  is heated with  $H_2O$  in an acid-binding medium. The reaction is effected under pressure at a temp. above  $100^\circ$ . The required high partial pressure of the  $CH_3Cl$  is maintained by continued addition thereof. Cf. C. A. 12, 702.

**Aldehydes; carboxylic acids.** SELDEN Co. and H. D. GIBBS. Brit. 119,517, Oct. 1, 1917. The oxidation of the side chains of aromatic hydrocarbons or their lower oxidation products is effected by passing the vapor of the hydrocarbon mixed with air or gas containing O, over a catalyst consisting of an oxide of a metal of the 5th or 6th periodic group, *e. g.*, Sb, Bi, Cr, W, U, and particularly V or Mo. Toluene vapor and air passed over  $V_2O_5$  at say  $350-450^\circ$ , give *benzaldehyde* and *benzoic acid*. The catalysts may be used singly or mixed, in a state of coarse or fine division, and on a carrier or not.

**Aldehydes; carboxylic acids; phthalic anhydride; quinones.** SELDEN Co. and H. D. GIBBS. Brit. 119,518, Oct. 1, 1917. The oxidation of aromatic hydrocarbons containing a plurality of side chains or a plurality of rings or their lower oxidation products is effected by passing the vapor of the hydrocarbon mixed with air or other gas containing O, at  $250-650^\circ$  over a catalyst consisting of an oxide of a metal of the 5th or 6th periodic group, *e. g.*, Sb, Bi, Cr, W, U, and particularly V or Mo. Xylene (*o*-, *m*-, or *p*-) vapor and air passed over  $V_2O_5$  at say  $350-550^\circ$  give methylbenzaldehydes, phthalaldehydes, benzenedicarboxylic acids, and some toluic and benzoic acid and benzaldehyde; naphthalene vapor treated similarly gives phthalic anhydride and acid, 1,4-naphthoquinone, benzoic acid, etc.; anthracene vapor at  $350-600^\circ$  gives anthraquinone. The catalysts may be used singly or mixed, in a state of coarse or fine division, and on a carrier or not.

**Purifying anthracene.** SOC. D'ECLAIRAGE CHAUFFAGE ET FORCE MOTRICE. Brit. 119,855, July 23, 1918. Crude anthracene is purified by dissolving it in warm phenols (crude phenol, cresols, xylenols, etc.) and crystallizing out. The crystals are washed with cresol and solvent is removed by heat, benzene, alk. soln., etc. The process may be repeated, and followed by a final purification by means of pyridine.

## II. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

## A. GENERAL.

FRANK P. UNDERHILL.

Sir W. H. Thompson. *Nature* 102, 170(1918).—Obituary. ALBERT R. MERZ.

Theory of the mechanism of disinfection, hemolysis, and similar processes. S. C. BROOKS. Harvard Univ. *J. Gen. Physiol.* 1, 61-80(1918).—The following conclusions are drawn from the available data: "1. The course of such processes as hemolysis is very largely dependent upon variations in resistance among the different individuals, and secondarily upon the course of the fundamental reaction. 2. The fundamental reaction may be either a simple process, or the expression of a complex series of changes whose rate is at all times governed by that of the slowest of the series. This might perhaps be regarded as another expression of the so-called 'law of the minimum.' 3. Unnatural assumptions would be requisite for the explanation of a resemblance between the course of such processes in general and that of a monomol. reaction. 4. The supposition that such a general resemblance exists is not supported by the available evidence. 5. The independent detn. of either the nature of the fundamental reaction, or the type of the variation curve for the particular case under observation, will further our knowledge of the nature of such processes and lead to a far deeper insight into the nature and reactions of living matter." JOSEPH S. HEPBURN.

Science and medical teaching. GRAHAM LUSK. *Science* 48, 629-35(1918).—An address. E. J. C.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Indicator method of measuring the consumption of oxygen. W. J. V. OSTERHOUT. Harvard Univ. *J. Gen. Physiol.* 1, 167-9(1918).—"The blood of the horseshoe-crab (*Limulus*) absorbs O and turns blue when shaken in air. In the presence of certain organisms which consume O it is quickly decolorized. By measuring the time required for the change of color the rate of consumption of O may be detd." A glass tube is used with rubber tubing attached to the open end. During the expt. the rubber tubing is clamped shut to exclude air. A control expt. is made using a tube without the organisms. JOSEPH S. HEPBURN.

Method of studying respiration. W. J. V. OSTERHOUT. Harvard Univ. *J. Gen. Physiol.* 1, 17-22(1918).—The organisms are placed in a wide-mouth bottle provided with a 3-hole cork. The exit tube from the bottle passes beneath the level of an indicator soln. in a stoppered test tube. The exit tube from the test-tube is connected with a rubber syringe, which in turn is attached to a tube passing to the bottom of the bottle containing the organisms. The third hole in the cork contains a tube with stopcock for introduction of reagents. By suitable arrangement of tubing and stopcocks, a U-tube containing solid NaOH may be inserted between the bottle and the test-tube and the gases evolved by the organisms can be passed (a) directly into the indicator soln., or (b) through the U-tube, then through the indicator soln. The air is kept in continuous motion by alternate compressions and expansions of the syringe, mechanically produced. The air is caused to circulate through the U-tube until the color of the indicator soln. becomes constant, then is made to circulate directly through the indicator soln., and the period of time is detd. which is required to produce a definite change in the color of the indicator. The air is again caused to circulate through the U-tube until the original color of the indicator is restored. The detn. is then repeated until the normal time of respiration is established. The reagent, whose influence on

respiration is to be studied, is next introduced; and the period of time required to produce the same definite change in the color of the indicator is detd. as before. It is desirable to compare the times required to produce equal amts. of  $\text{CO}_2$  rather than to compare the amts. of  $\text{CO}_2$  produced in equal times. The initial and final colors may always be controlled by standard tubes containing the indicator and buffer solns. The amt. of  $\text{CO}_2$  produced by the organisms in a given time may be ascertained if desired; the relation between the amt. of  $\text{CO}_2$  in the app. and the  $p_{\text{H}}$  of the indicator soln. is previously detd. by expt.; after respiration it is only necessary to det. the  $p_{\text{H}}$  of the indicator soln. by comparison with similar tubes containing the same concn. of indicator and solns. of known  $p_{\text{H}}$ . The method may also be used for the study of photosynthesis by introducing known amts. of  $\text{CO}_2$  into the app. at the beginning of the expt.

JOSEPH S. HEPBURN.

### C. BACTERIOLOGY.

Hemotoxic action of the diphtheria bacillus and its diagnostic value. S. COSTA, J. TROISIER AND J. DAUVERGNE. *Compt. rend. soc. biol.* 81, 89-91 (1918).—The diphtherolysin was as a rule only detected in well developed cultures; the same bacillus, according to the culture, caused rapid hemolysis in 3 hrs. or delayed hemolysis in 48 hrs. Even the most actively hemolyzing cultures were inactivated by filtration and sometimes by simple sedimentation. The diphtherolysin is thermolabile. The cultures lost hemolytic action when heated 30 mins. at  $60^\circ$  and hemolytic action was greatly reduced by heating at  $48-56^\circ$ . The hemolysin remained intact at  $40^\circ$ . Aging of the cultures produced results similar to those obtained by heating at  $60^\circ$ . The anti-hemolytic action of antidiphtheric serum *in vitro* compared with its favorable action on the anemia of patients indicates that the diphtherolysin, which is an endohemolysin *in vitro*, behaves as an exotoxin *in vivo*. All the diphtheria bacilli which were identified by the biochem. formula previously proposed by C., T. and D. showed hemolytic action *in vitro*, regardless of their origin and their virulence toward guinea pigs. The rapidity of hemolysis was variable, but likewise independent of toxicity or origin. The periods required for hemolysis were 3-6 hrs. in 22%, 10-24 hrs. in 37% and 30-48 hrs. in 33% of the expts. All pseudodiphtheria of the pharynx were found to be without action on glucose, levulose and maltose and likewise without hemolytic action; this confirms the accuracy of the biochem. formula proposed. This method may also be used for differentiating the diphtheria bacillus from the diphtherimorphic bacteria of the cutaneous tissue, nasal fossae and conjunctivae. A considerable no. of races of *B. cutis communis*, the biochem. formula of which had been detd., failed to show any hemolytic action after 5-6 days' contact. The hemotoxic action of the diphtheria bacillus is therefore, contrary to the view of Schwoner, a sp. property and is to be considered in connection with its action on sugars for purposes of identification.

H. S. PAINE.

Acid chlorinated solutions for continuous irrigation of wounds; chlorinated bicarbonate and alum solutions. W. MESTREZAT. *Compt. rend. soc. biol.* 81, 91-3 (1918).—The alkalinity of chlorinated solns. such as the Dakin and Daufresne solns. has the disadvantage of reducing by approx.  $\frac{1}{2}$  the germicidal action of the Cl. The detergent action of such solns. is also considerably less than is often claimed and is not as great as that of the 2 following solns. which are recommended by W.: For the prepn. of (a) the chlorinated bicarbonate soln. add to the required vol. of  $\text{H}_2\text{O}$  the necessary amt. of chloride of lime (depending on the Cl content), allow to stand, decant and add 12 g.  $\text{NaHCO}_3$  (previously dissolved in 100 cc.  $\text{H}_2\text{O}$ ) to each l. of decanted liquid. Add (with agitation) a 10:100  $\text{Na}_2\text{CO}_3$  soln. until the filtered soln., mixed with an equal vol. of 20:100 hyposulfite soln., gives a very slight alk. reaction to phenolphthalein, and then filter. A properly prepd. soln. contains 0.45:100 of active Cl,



and less than 0.5 g.  $\text{Na}_2\text{CO}_3$  and 2-3 g.  $\text{NaHCO}_3$  per l. If too much  $\text{Na}_2\text{CO}_3$  is added the soln. is brought back to neutrality by introducing a current of  $\text{CO}_2$ . This soln. is not stable and should be used within 3 days. In order to prep. (b), the chlorinated alum soln., add to the necessary vol. of  $\text{H}_2\text{O}$  the required amt. of chloride of lime to give the proper Cl content, allow to stand 12 hrs., decant, add 17-20 g. powdered alum per l., allow to stand 2 hrs. and filter. This soln. should contain 0.45:100 of active Cl and should show approx. 0.01 *N* acidity with phenolphthalein indicator. This acidity is detd. by means of 0.1 *N* NaOH after addition of 10 cc. 20:100 hyposulfite soln. to 10 cc. of the filtered soln. Too great acidity increases the coagulating action and may prevent proper irrigation, while too low acidity causes decrease in antiseptic action. Soln. (b) is stable; it causes a flow of serum to the wound and this exudate coagulates on the surface of the tissues.

H. S. PAINE.

**Bactericidal properties of the chlorine ion; comparative study of the antiseptic action of acid and alkaline hypochlorite as used in surgery.** R. J. WEISSENBAUGH AND W. MESTREZAT. *Compt. rend. soc. biol.* 81, 93-6(1918).—W. and M. studied the comparative bactericidal action of Dakin-Daufresne alk. hypochlorite soln. and solns. (a) and (b) (cf. preceding abst.) on *B. perfringens*, pyocyanic and paratyphoid bacilli, yellow staphylococcus and spores of *B. sporogenes*. The active Cl content of the solns. varied from 0.42:100 to 0.46:100 in different expts. but, for any given expt., was kept rigorously the same for all 3 solns. The bactericidal action of all 3 solns. on the spores of *B. sporogenes* was nil, even after 24 hrs. contact. The min. time required to kill the bacteria by contact with the alk. hypochlorite soln. was approx. twice that required with solns. (a) and (b), the periods required being practically the same for the 2 latter. The bactericidal action for the same soln. and the same bacillus varied within very narrow limits from 1 expt. to another for the same concn. of soln. The variations in bactericidal action for the same soln. and different bacilli were comparatively slight; the min. periods of contact with the 4 bacilli required for the Dakin-Daufresne and (a) and (b) solns. were 45-60, 20-30 and 20-30 mins., resp. The greater bactericidal action of the acid solns. is connected with the ready decompn. of  $\text{HClO}$  in an acid medium with production of nascent O.

H. S. PAINE.

**Study of the Pfeiffer bacillus.** A. LATAPIE. *Compt. rend. soc. biol.* 81, 833-5 (1918).—A serum with pronounced sp. properties was obtained from animals immunized with the Pfeiffer bacillus. The serum had a distinct curative action and prevented the death of guinea pigs after inoculation with lethal amts. The serum of the immunized animals (goats) was toxic in the case of blood withdrawn too soon after the last injection of bacteria. Intraperitoneal injection of this serum killed guinea pigs and subcutaneous injection caused edema. Serum from blood withdrawn 20 days after the last injection did not show any toxicity.

H. S. PAINE.

**Nonagglutinable bacteria.** M. NICOLLE, C. JOUAN AND E. DERAINS. *Compt. rend. soc. biol.* 81, 839-40(1918).—One-tenth cc. of *N* HCl was added to 20 cc. of an emulsion of 1 cg. of gonococci in physiol. NaCl soln.; the mixt. was heated 5 mins. in boiling  $\text{H}_2\text{O}$ , cooled and neutralized with 0.1 cc. of *N* NaOH. The gonococci, after treatment with HCl, were readily agglutinated by an antigonococcic serum which, before this treatment, failed to cause agglutination, although it readily fixed complement in their presence and exhibited undeniable therapeutic action. A no. of races of pneumococcus which were not agglutinated by various antipneumococcic sera were readily agglutinated by the appropriate sera after treatment with HCl. The conception of a separate and strictly nonagglutinable type of pneumococci should be abandoned. It was necessary in some cases to increase the above proportion of HCl to 0.2-0.5 cc. Treatment of nonagglutinable bacteria with NaOH usually failed to give as good results as treatment with HCl (equally as good results in a few cases,

but rarely superior). Restoration of agglutinability in this manner has considerable practical value for the sero-identification of races of pneumococci and various other nonagglutinable bacteria. This restoration of agglutinability is, as stated by Porges, due to hydrolysis of the mucous capsule.

H. S. PAINE.

EISENBERG, ARTHUR A.: *Principles of Bacteriology*. St. Louis: C. V. Mosby Co. 198 pp. \$1.75.

#### D. BOTANY.

CARL L. ALSBERG.

Present state of the anthocyanin question., II. Chemical constitution of anthocyanin. J. BEAUVERIE. *Rev. gén. sci.* 29, 604-12(1918); cf. C. A. 13, 139. E. J. C.

Difference in the action of radium on green plants in the presence and absence of light. CHARLES PACKARD. *J. Gen. Physiol.* 1, 37-8(1918).—The Ra prepn. contained 20.4 mg. of Ra element and was enclosed in a thin-walled Ag tube, which was placed in a watch-glass filled with water; *Spirogyra* filaments were laid across it; a typical phenomenon of disintegration occurred; the chlorophyll bands first contracted somewhat and lost their spiral shape, then resolved into an irregular heap of chlorophyll at one end of the cell. The cells nearest the tube containing Ra showed this phenomenon in 2.5 to 3 hrs. in the light, and in 35 to 70 (av. 45) min. in the dark. The tube containing Ra was introduced into a small glass tube in which colonies of *Volvox* were present; the av. time required for the colonies to become motionless was: 2 hrs. in the light, 55 min. in the dark. "It is very evident that the life of the cell is prolonged by some condition connected with photosynthesis."

JOSEPH S. HEPBURN.

Experiments on the injurious effects of frost on grains and legumes. H. FISCHER. *Jahresbericht Vereinigung angew. Botanik* 13, 92-141(1916); *Z. Pflanzenkrankh.* 27, 314(1917); *Biedermanns Zentr.* 47, 212-3(1918).—Plants affected by frost show a blackish green coloration of the leaves which corresponds with a marked plasmolysis of the cell-contents but which is also ascribable to the direct effect of cold on the chlorophyll pigment. Numerous expts. on the effects of cold on grains and legumes are reported and discussed.

ALBERT R. MERZ.

Growing lupines with a low alkaloid content. TH. RÖMER. Bromberg. *Landw. Jahrb.* 50, 433-4(1917); *Biedermanns Zentr.* 47, 209-12(1918).—Lupines contain 0.2 to 1% alkaloid, which it has for the most part been necessary to remove by Kellner's process. Lupines thus treated must be fed immediately or dried, as they can not be kept in a wet state. Expts. have been conducted to ascertain whether lupines could be raised which could be fed directly to cattle without previous removal of their bitterness. Crossing of different varieties was unsuccessful as the hybrids were seedless. Whether improvement can be brought about by selection has not yet been detd. though it has been definitely ascertained that the descendants of individual plants show considerable differences in alkaloid content. It remains to be seen whether these differences are inheritable. Only the Steiner-Baumert method could be used for the detn. of alkaloid though even this is tedious. Using Steiner's factor of 500 for obtaining the degree of bitterness, blue lupines have a bitterness of approx. 30; lupines treated by Kellner's process, approx. 10. The taste becomes distinctly bitter at 12. ALBERT R. MERZ.

Reflections upon the chemical analyses of marine algae. C. SAUVAGEAU. *Rev. gén. sci.* 29, 541-51(1918).—A review of the studies on the chem. compn., especially the K and I contents of marine algae. The criticism is given that analyses have often been made upon material comprizing different species, gathered at different times of the year, from various habitats and of different stages of development. It is emphasized that these factors have an important bearing on the chem. compn. of marine algae.

CHAS. H. RICHARDSON.

Note upon the hydrogen-ion concentration necessary to inhibit the growth of four wood-destroying fungi. MERLE R. MEACHAM. *Science* 48, 499-500(1918).—The following species were studied upon synthetic and malt extract media: *Lensile sepiaria*, *Pomes roseus*, *Comiophora cerebella* and *Merulius lachrymans*. The response to H-ion was about the same in the four species, and the curves (obtained by plotting as ordinates the wts. in g. of mycelium produced in 5 weeks with the  $P_H$  values as abscissas) were similar to those showing the relation between enzyme activity and H-ion concn. The first critical point, i. e., the point where the first marked deflection in the growth curve occurred, was reached when the  $P_H$  was equivalent to about  $1/100$  N acidity and the limiting acidity was reached when the  $P_H$  equaled about  $1/60$  normal.

CHAS. H. RICHARDSON.

MOLISCH, H.: *Pflanzenphysiologie als Theorie der Gärtnerei*. Jena: G. Fischer. 306 pp. Zweite Aufl. 324 pp. For review see *Physiol. Abstracts* 3, 497(1918).

## F. PHYSIOLOGY.

ANDREW HUNTER.

Present status of our knowledge of fatigue products. ERNEST L. SCOTT. *Public Health Repts., Reprint* No. 465; *Am. J. Public Health* 8, 735(1918).—S. summarizes his paper as follows: (1) Substances carrying H-ions, as lactic and  $\beta$ -hydroxybutyric acids,  $KH_2PO_4$  and  $CO_2$ , stand as causal agents of fatigue. (2) Certain products of protein disintegration, as indole, skatole and phenol, may produce fatigue symptoms, and may be active agents in producing normal fatigue. (3) There is some evidence that the negative ion of lactic and  $\beta$ -hydroxybutyric acids and that certain positive ions, especially  $K^+$ , are capable of producing certain fatigue phenomena. (4) There is no evidence that the negative ions of  $H_2CO_3$ ,  $H_2PO_4$  or  $H_2SO_4$  are fatigue substances. (5) There is no evidence at present for the existence of sp. fatigue substances as proposed by Weichardt. (6) There is very little probability that creatine or creatinine have any relation to fatigue or to muscle work in general. (7) There are no doubt numerous compds., as purine bases, uric acid, etc., which may be increased by work, but which have no causal bearing on fatigue.

E. J. C.

Is there a thymic hormone? E. R. HOSKINS. *Endocrinology* 2, 241-57(1918).—After an exhaustive critical review of the literature, the following conclusion is reached: "Whatever be the real function of the thymus, certain it is that its production of an internal secretion has not been proved. The evidence in favor of such a theory is but circumstantial at best and very meager. It is equally difficult to prove that the thymus does not produce a secretion, but the burden of proof is upon those who support the former theory." It is suggested that the thymus functions during infancy and childhood as a lymphoid organ producing lymphoid cells and leucocytes; its atrophy occurs as the body acquires resistance to infection, and the lymphocyte percent decreases in the blood. A bibliography of 41 references is appended.

J. S. H.

Active coöperation between the physiologist and the clinician and comparative analysis of coördinated data in the study of the internal secretions. CHARLES E. DE M. SAJOUS. *Endocrinology* 2, 258-82(1918).—The 1918 Presidential Address of the Assoc. for the Study of the Internal Secretions. The thesis presented is that the knowledge of the endocrine glands will be greatly increased by coöperation of the clinician and the physiologist, utilizing the special knowledge of each. The internal secretion of the adrenals is discussed at length, with stress on its role in the alveolar gas exchange, tissue oxidation, and the O-carrying power of the blood—the respiration theory.

JOSEPH S. HEPBURN.

Iodine as the active principle of the thyroid gland. W. W. SWINGLE. Princeton Univ. *Endocrinology* 2, 283-8(1918).—Both normal and thyroidectomized larvae of

the common leopard frog (*Rana pipiens*) and of the toad (*Bufo lentiginosus*) were used as exptl. animals. Separate groups of the same age were given one of the four reagents: I, KI, KIO<sub>3</sub>, and CHI<sub>3</sub>; and the influence upon the metamorphosis was detd. I produced metamorphosis in both normal and thyroidectomized larvae more rapidly than any of the other reagents; CHI<sub>3</sub> was slightly less potent than I; KI was much slower than CHI<sub>3</sub>; and KIO<sub>3</sub> had practically no effect. The normal larvae, which had received I, had very much smaller thyroids than control larvae of the same age and size. "The results of the expts. appear to indicate very strongly that I is the active principle of the thyroid gland, and that this substance functions within the organism as a hormone itself without the intermediation of the gland. The function of the thyroid, then, appears to be chiefly that of extracting and storing the physiologically active I, rather than elaborating an active hormone itself." Normal blood serum was found able to dissolve 0.00075 g. I per cc. JOSEPH S. HEPBURN.

Effect of the X-ray upon the response of tadpoles to thyroid stimulation. CAREY P. McCORD AND CARLTON J. MARINUS. *Endocrinology* 2, 289-300(1918).—Selected tadpoles of the bull-frog (*Rana catesbeiana*) were subjected to the action of Röntgen rays in small amts. Certain individuals were then treated with thyroid gland preps. and their rate of metamorphosis compared with the rate in (1) normal tadpoles, (2) thyroid-fed tadpoles not irradiated, and (3) irradiated tadpoles not fed thyroid. The results indicated that irradiation apparently was without effect on normal tadpoles, but produced a slight, nevertheless distinct, increase in the susceptibility of young tadpoles to thyroid stimulation. JOSEPH S. HEPBURN.

Antagonism between thymus and parathyroid glands. EDUARD UHLENHUTH. Rockefeller Inst. *J. Gen. Physiol.* 1, 23-32(1918).—Thymus is substituted for thyroid in the title as a correction. The larvae of salamanders do not possess parathyroids. When larvae of the species *Amblystoma maculatum* and *A. opacum* were fed exclusively on calf thymus, tetany invariably developed; the symptoms closely resembled those of the tetany which follows parathyroidectomy in mammals. The tetany did not develop in the larvae until their thymus glands were able to secrete. "This suggests that tetany is the effect of the combined action of the secretion of certain substances by the thymus glands of the larvae and of substances introduced into the larva by feeding it with the thymus gland from other animals." During metamorphosis the parathyroid glands develop; and tetany does not occur after metamorphosis. The larvae possess a second mechanism to counteract the action of the thymus; *A. maculatum* and *A. opacum* larvae possess 6 well developed thymus glands and no parathyroids, yet are not normal victims of tetany; moreover larvae of *A. tigrinum* do not develop tetany even on a diet of thymus, though they also lack parathyroids. In the larvae of the first 2 species this second mechanism "is sufficient only to prevent tetany from the animal's own thymus, while in the larvae of *A. tigrinum* it is capable of preventing tetany even when the larvae are fed with thymus." In man, tetany occurs more frequently in children than in adults, perhaps because in the latter the thymus has been largely replaced by connective tissue. Tetany in pregnancy may possibly be due to the fact that the parathyroids of the mother may be able to prevent tetany from her own largely atrophied thymus, but are insufficient to prevent tetany from the excess of the thymus substance furnished to the blood of the mother by the fetus. JOSEPH S. HEPBURN.

Further proof of the existence of a specific tetany-producing substance in the thymus gland. EDUARD UHLENHUTH. Rockefeller Inst. *J. Gen. Physiol.* 1, 33-6 (1918).—The tetany produced in salamander larvae by a diet of thymus (see preceding abstract) is not due to a deficiency in the ration. Earthworms constitute a complete diet for the larvae; nevertheless when larvae of *Amblystoma maculatum* were fed alter-

nately, one day on thymus and one day on earthworms, tetany developed and was due to a specific tetany-producing substance contained in the thymus gland. "The effect of the thymus gland in producing tetany is due to a specific tetany toxin produced by and contained in the thymus, and the thymus gland must be added to the group of glands for which the function of internal secretion has been demonstrated."

JOSEPH S. HEPBURN.

**Cholesterol content of the suprarenals at different stages of fetal life.** A. CHAUFARD, GUY LAROCHE AND A. GRIGAUT. *Compt. rend. soc. biol.* 81, 87-9(1918).—The cholesterol content of the liver and kidneys varied only slightly during fetal life and showed approx. physiol. values from practically the beginning of intrauterine life. The cholesterol content of the suprarenals reached a value in 3 mos. which was equal to the max. value for the liver and kidneys; it increased rapidly with the age of the fetus and reached an av. value of 15 g. per 1000 at birth. While the cholesterol content of the liver and kidneys had a value characteristic of normal tissue compn. that of the suprarenals was in the nature of a reserve. During the initial stage of intrauterine life the cholesterol requirements of the fetus are supplied solely by cholesterol hypogenesis on the part of the mother. During the later stages endogenous cholesterol secretion is a parent in the suprarenal cortex of the fetus.

H. S. PAINE.

**Digestion in the region of the cecum.** P. CARNOT AND H. BONDROY. *Compt. rend. soc. biol.* 81, 487-90(1918).—Digestion and absorption in the region of the cecum was studied in a subject with cecal fistula and partial obstruction of the colon, thus permitting comparison of the anal and cecal evacuation. Sucrose (20 g. in 200 cc. H<sub>2</sub>O ingested during fast) appeared in considerable amt. in the cecal evacuation in 1 hr., remained in appreciable amt. after 2 hrs. and was not detected after 2½ hrs.; it did not appear in the anal excretion. Lactose (50 g. in aq. soln. during fast) passed into the cecum in 2 hrs. When the subject ingested at the same time an appreciable amt. of yoghurt the cecal evacuation (ordinarily neutral) was distinctly acid and contained lactic acid due to fermentation of lactose. The anal stools were not acid and contained neither lactose nor lactic acid, these substances being entirely absorbed in the cecum and ascending colon. The cecal evacuations became neutral when ingestion of lactose was discontinued, although yoghurt continued to be ingested. Starch (30 g. as paste during fast) passed in part to the cecum where it was detected after 3 hrs. and for 3 hrs. thereafter; it was accompanied by erythrodextrins which were absorbed at this point. Ovalbumin and albumoses, but not peptones, were detected in the cecal evacuation 3 hrs. after ingestion of 2 egg whites in 250 cc. H<sub>2</sub>O during fast. The albumoses disappeared after 4 hrs. but traces of ovalbumin remained. No ovalbumin, albumoses or peptones appeared in the corresponding anal stools. Crystals of tyrosine also appeared in the cecum. Tyrosine was not found in the ileum by Macfadyan, Nenki and Sieber and it appears that degradation of albumins is completed in the cecum. Indole and phenols were detected in the cecal content. Peptones (10 g. in 250 cc. H<sub>2</sub>O during fast) were not detected in the cecum and were entirely absorbed or transformed in the small intestine. Further expts. relative to fats and soap are required. Invertase was present, but trypsin, lipase, diastase and rennin were not detected in the cecum. The true bile pigments were also not present in the cecum, although urobilin was readily detected. Bile salts (Pettenkoffer reaction) were not detected; they were entirely absorbed or transformed in the small intestine. The absorption of various medicaments was studied. Certain easily absorbed sol. salts did not appear in the cecum (at least when administered in therapeutic doses). Salts such as KI and Na salicylate (1 g. in soln. during fast) which are quickly absorbed and readily eliminated in the urine did not reach the cecum. Purgatives usually reached the cecum. Rhubarb (1 g. during fast) was only detected (Borntraeger

reaction) in the cecal evacuation after 5 hrs. and disappeared within 1 hr. Similar results were obtained with senna. Phenolphthalein (0.3 g. ingested) gave after 2 hrs. a distinct reaction which reached a max. after 5 hrs. and continued for 7 hrs. The role of the cecum is, therefore, not negligible. While enzymic activity in the cecum is slight, absorption at this point is very considerable. The delay in appearance of the purgatives in the cecum appears to correspond to the rate of the purgative action itself. Absorption of  $H_2O$  in the cecum was also observed to be intense.

H. S. PAINE.

GLEE, E.: *The Internal Secretions*. Translated by M. Fishberg. London: W. Heinemann, Ltd. 241 pp. 10s. For review see *Physiol. Abstracts* 3, 496(1918).

PATON, D. NOËL, CATHCART, E. P. AND BURNS, D. *A Practical Course of Chemical Physiology*. 4th Ed. Glasgow: James Maclehose & Sons. 44 pp. 2s. For review see *Physiol. Abstracts* 3, 498(1918).

PATON, D. NOËL AND CLARK, G. H.: *A Practical Course of General Physiology*. 4th Ed. Glasgow: James Maclehose & Sons. 58 pp. 2s. 3d. For review see *Physiol. Abstracts* 3, 498(1918).

#### G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

A glycerol "extract" of tubercle bacilli as an antigen in complement fixation. S. A. PETROFF. Trudeau, N. Y. *Am. Rev. Tuberculosis* 2, 523-4(1918).—The following antigen is recommended as the most reliable of the single antigens tried. Tubercle bacilli are grown on 4% glycerol beef-broth 4 to 6 weeks, the cultures filtered off, washed with sterile  $H_2O$ , dried over  $H_2SO_4$  several days, and pulverized in ball mill for several weeks. One g. of pulverized bacilli is triturated in a mortar with 100 cc. 25% glycerol and boiled slowly for 1 hr. under a reflux condenser, after which the clumps are allowed to settle and the supernatant suspension used—0.1 cc. of a 5% diln. representing  $1/4$  of the anticomplementary point.

H. J. CORPER.

The clinical value of complement fixation in pulmonary tuberculosis based on a study of 540 cases. LAWRASON BROWN AND S. A. PETROFF. Trudeau, N. Y. *Am. Rev. Tuberculosis* 2, 525-40(1918).—A positive complement fixation test was obtained in 72% of 478 patients in whom a diagnosis of tuberculosis was made; 51% of the incipient, 73% of the moderately advanced and 81% of the far advanced were positive; when activity was present 81%, absent 61%, and questionable 79% were positive; 9.8% of patients who have had tubercle bacilli in the sputum at some time reacted negatively; 90% in whom tubercle bacilli were present at time of examn. were positive; a larger percentage (85%) of cases with hemoptysis than of those without (64%) were positive; patients with a negative reaction can be allowed to exercise more freely than those with a positive. The complement fixation test and cellular hypersensitiveness as manifested by the intradermic reaction to old tuberculin do not run a parallel course; many patients react to the tuberculin and have a negative complement fixation test (the opposite may occur). Patients with pleurisy with effusion do not react readily, and the presence of a positive Wassermann test has no bearing upon the complement fixation test in tuberculosis. Only  $1/4$  of the incipient,  $1/4$  of the moderately advanced and  $1/4$  of the far advanced cases show any change in their reaction during five to six months.

H. J. CORPER.

The complement fixation test in tuberculosis. LINDA B. LANGE. Baltimore, Md. *Am. Rev. Tuberculosis* 2, 541-5(1918).—Four antigens (bacillary suspension of Miller and the NaOH,  $CH_3OH$ , and potato broth culture filtrates of Petroff) were used in the examination of 856 sera. Tuberculous sera gave 51.5% of fixation of any degree while non-tuberculous sera gave 13.6%. The alc. antigen gave the highest percentage

of strong fixations in clinically tuberculous cases and the NaOH antigen the lowest. With the sera from non-tuberculous cases the greatest proportion of strong fixations was obtained with the NaOH antigen and the smallest with the potato filtrate antigen. All tend to give a greater percentage of strong fixations with the sera of more advanced active pulmonary cases than with those of the less advanced. The results obtained in non-tuberculous medical cases (of all types) are given. Of 147 patients giving a positive Wassermann reaction but free from clinical tuberculosis 22 gave a positive tuberculosis fixation.

H. J. CORPER.

The value of tuberculosis complement fixation in clinical tuberculosis. B. STRIVELMAN. Bedford Hills, N. Y. *Am. Rev. Tuberculosis* 2, 546-50(1918).—Examn. of 205 cases using Miller's antigen for complement fixation revealed about 52% positive reactions alike in active and inactive consumptives; 41% of active tuberculous cases with positive sputum and 72% of active cases with negative sputum showed a negative tuberculosis fixation reaction. A positive reaction is obtained more frequently as the disease progresses while in early cases the percentage of positive reactions is exceedingly low (15.8% active and 39.5% inactive). Of non-tuberculous cases 32% were positive.

H. J. CORPER.

Attempts to reduce the resistance of the guinea pig to tuberculosis by means of various agents. The effects of the Röntgen ray, benzene, Thorium X, tuberculin, ether and chloroform. H. J. CORPER. Chicago. *Am. Rev. Tuberculosis* 2, 587-603 (1918).—These expts. were performed to find a substitute (available to all) for the X-ray for increasing the susceptibility of the guinea pig to tuberculosis, a method recommended by Morton (*J. Exp. Med.* 24, 419-27(1916)) for hastening the animal diagnosis of tuberculosis. A single exposure to the Röntgen ray (as directed by Morton), sufficient to cause a temporary leucopenia in guinea pigs infected with a small amt. (0.000001 mg.) of virulent human tubercle bacilli, produced no appreciable effect upon the course of the macroscopic tuberculosis in these animals. Likewise a leucopenia (as low as about 2500, as compared to a normal of about 12,000 leucocytes per cu. mm. of peripheral blood) occasioned by the X-ray, existing at the time and persisting throughout the period of infection, produced just as little effect.  $C_6H_6$ , in a single large (7.5 cc.) or repeated small (1 cc.) subcutaneous injections with an equal part of paraffin (m. 56°), or inhaled once or twice daily for a month to the point of anesthesia, had no appreciable effect upon the course of the macroscopic tuberculosis in guinea pigs produced by the injection of virulent human tubercle bacilli. Benzene injected subcutaneously into guinea pigs with an equal part of paraffin is slowly absorbed,  $\frac{1}{2}$  remaining the first day,  $\frac{1}{2}$  after the second,  $\frac{1}{2}$  after the third and  $\frac{1}{10}$  after the tenth day. Th X in amt. sufficient to maintain a marked leucopenia (as low as approx. 1500 leucocytes per cu. mm. of peripheral blood) throughout the entire period of infection of guinea pigs by the subcutaneous injection of virulent human tubercle bacilli (0.000001 mg.) produced no effect upon the course of the macroscopic tuberculosis in these animals. Tuberculin (Koch's O. T.) in large doses also had no appreciable effect upon the course of human tuberculosis in the guinea pig.  $Rt_2O$  by inhalation to the point of light anesthesia daily for about a month did not increase the susceptibility of guinea pigs to tuberculosis.  $CHCl_3$  inhalation proved highly toxic and were only given a short time without effect upon the tuberculosis of the guinea pig.

H. J. CORPER.

Laboratory investigations on the physical properties of root filling materials and the efficiency of root fillings for blocking infection from sterile tooth structures. WESTON A. PRICE. *J. Nat. Dental Assoc.* 5, 1260-80(1918).—The physical properties of gutta-percha and its solns. are described at length. Bacteriological expts. on teeth demonstrated that gutta-percha fillings by no means prevented subsequent bacterial infection of the teeth. The paper contains reports by Dayton C. Miller on: Expansion of

sheet gutta-percha; effects of  $\text{CHCl}_3$  on gutta-percha; some physical properties of rosin dissolved in  $\text{CHCl}_3$ , gutta-percha dissolved in  $\text{CHCl}_3$ , and gutta-percha dissolved in  $\text{CHCl}_3$  and eucalyptol oil.

JOSEPH S. HEPBURN.

Opsonin investigation in wounded soldiers with wounds infected with streptococcus. LÉ FÈVRE DE ARRIC. *Compt. rend. soc. biol.* 81, 827-9 (1918).—The serum of wounded soldiers with recent wounds infected with streptococcus gave low opsonic values, almost always less than unity. The heated serum of the same soldiers always gave high opsonic indexes, greater than unity. Opsonic detns. on the serum of wounded soldiers with old streptococcic wounds (6-12 weeks following the lesion) gave values sometimes higher but oftener less than 1. High results were always obtained with inactivated sera. The highest opsonic indexes were found, as a rule, in the case of the oldest wounds. Expts. by heating (to  $56^\circ$  or higher temps.) showed that, with rare exceptions, the sera of soldiers with streptococcic wounds was always richer in thermostable opsonizing substances than was normal serum. In general the opsonic index for the same individual increased with the evolution of the wound. The highest values, and especially those obtained with heated sera, were found in the case of very old wounds. A no. of observations indicated that as the opsonic index of the serum increases the bacteria may become independently more susceptible to phagocytic attack. This fact is perhaps connected in some way with attenuation, although there is nothing to show that attenuation or reduction of germinative power is not the exact result of the prolonged action of the medium, serum or exudate. In this connection it should be noted that, according to Levaditi, streptococcus very often sensitizes the organism for a considerable period instead of immunizing it. The above results are believed to warrant the view that the opsonic effect is one of the manifestations of immunity. H. S. P.

LICHTWITZ, L.: *Klinische Chemie*. Berlin: Julius Springer. 363 pp.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Comparative studies on respiration. I. Introduction. W. J. V. OSTERHOUT. *J. Gen. Physiol.* 1, 171-9 (1918).—The technic of the indicator method for the study of respiration (see C. A. 10, 2470; 13, 231) and its applications are discussed. By this method, the following results were obtained: "When anesthetics are employed in sufficient concn. to produce any result, plants show a rise in the rate of respiration which is followed by a fall. In the animals studied, the rise (found in higher concns. only) was preceded by a temporary fall which is not entirely due to lowering of muscular activity or tonus. In lower concns. the effect on animals was merely a decrease of respiration." II. Effect of anesthetics and other substances on the respiration of *Aspergillus niger*. F. G. GUSTAFSON. *Ibid* 181-91.—When the concn. was high enough to produce any effect,  $\text{HCHO}$ , ether, and acetone produced an increase, followed by a decrease in the rate of respiration. When a 3.65% soln. of ether in water was used, it caused an increase in the rate of respiration with certain cultures, but caused only a decrease with other cultures of the mold. When 7.3% ether (satd. aq. soln.) was used, the reaction which caused an increase in the respiration was a reversible process, while the reaction which caused the decrease was not reversible. Caffeine in 0.5% soln. only decreased the respiration, while its satd. soln. first increased, then decreased the respiration. III. Effect of ether on the respiration and growth of *Bacillus subtilis*. MARTHA M. BROOKS. *Ibid* 193-201.—Aq. solns., containing from 0.037% to 7.3% ether, produced an increase, followed by a decrease, in the rate of respiration of *Bacillus subtilis*. A 7.3% soln. of ether in tap water increased the output of  $\text{CO}_2$  to 50 times its normal value; this increase did not occur when a 7.3% soln. of ether in 0.85%  $\text{NaCl}$  soln. was used; apparently antagonism exists between  $\text{NaCl}$  and ether.



Low concns. (0.037 to 1.1%) and high concns. (3.65 to 7.3%) of ether were toxic to *B. subtilis*, while intermediate concns. (1.1 to 3.65%) stimulated its growth. IV. Effect of ether on the respiration of wheat. HELEN S. THOMAS. *Ibid* 203-7.—When wheat seeds, which had been soaked for 12 hrs. and had entered on the first stages of germination, were treated with aq. solns. containing 7.3% and 3.65% resp. of ether by vol., their rate of respiration first increased, then decreased. V. Effect of ether on the production of carbon dioxide by animals. MARIAN IRWIN. *Ibid* 209-20.—With *frog tadpoles* 0.15, 0.37 and 0.55% ether solns. decreased the output of CO<sub>2</sub> while the movements of the body and of breathing remained normal; the effect was reversible. Ether in concns. of 3.65% and 7.3% produced a decrease in respiration, followed by an increase to as high as 3 times the normal rate, after which a decrease again occurred; the effect was irreversible. With the common *whirligig beetle* (*Dineutes assimilis*), 7.3% ether produced the sequence: decrease, increase, decrease in respiration, the effect being irreversible; 7.3% ether gave similar results with *frog eggs* in the blastopore stage. With *fish embryos* (*Fundulus heteroclitus*), a reversible decrease in production of CO<sub>2</sub> occurred in 0.73% ether; this decrease was not sufficient to produce narcosis. In 3.65% ether, a temporary decrease was followed by an increase, then came another decrease; in 7.3% ether an immediate increase of as high as 307% occurred, after which a decrease was noted; these increases were accompanied by irreversible changes ending in death. "These expts. show that narcosis is not due to asphyxia. The action of anesthetics is due to some other cause than the effect on respiration." In animals the increase in CO<sub>2</sub> output was accompanied by irreversible changes leading to death; this was not necessarily the case in plants. The reversible (narcotic) action of ether was accompanied by a decrease in CO<sub>2</sub> production in animals, but not in plants as a rule.

JOSEPH S. HEPBURN.

Slight toxicity of colloidal arsenic. E. SOREY. *Compt. rend. soc. biol.* 81, 57-8 (1918).—Intravenous injection of colloidal As in amts. less than 0.05 g. per kg. never caused death in case of rabbits; the latter developed normally in spite of daily injections of 0.04 g. As per kg. for 15 days. Death did not always occur after doses of 0.05 g. per kg.; injection of at least 0.08 g. per kg. was required in order to cause certain death within 24 hrs. The primary mechanism of death was the same as with all undissolved substances (whether colloidal or not) introduced into the blood stream, *i. e.*, obstruction of the pulmonary capillaries. Animals killed in this manner showed the usual symptoms of asphyxia and congestion of the lungs. The lungs of animals killed by colloidal injections assumed the color of the colloid (grayish in the case of As). Colloidal As did not, however, act entirely in a mechanical manner; As was found in soln. in the urine and must, therefore, have reacted in a chem. manner in some portion of the organism. This solvent action was very slow and the As was well tolerated even in the max. sublethal amts. It should be possible intravenously to inject 3 g. colloidal As into a 60 kg. man without danger, this amt. being equiv. to 15 g. arsenobenzene, 6.30 g. Na cacodylate, 10.80 g. arrhenal, 9.60 g. atoxyl, 7.70 g. As<sub>2</sub>O<sub>3</sub>, 12.30 g. Na arseniate.

H. S. PAINE.

## I. ZOÖLOGY.

R. A. GORTNER.

Studies on bioluminescence. VII. Reversibility of the photogenic reaction in *Cypridina*. E. NEWTON HARVEY. *J. Gen. Physiology* 1, 133-45 (1918).—At least three substances are concerned in light production in the crustacean, *Cypridina*, namely luciferin, luciferase and photophelein. Luciferin, previously included in the definition of photophelein, is a compd. oxidizing with light production, dialyzable and relatively resistant to heat. It is found only in luminous animals. Luciferase, previously called photogenin and similar to luciferase as described by Dubois (*Compt. rend. soc.*

*biol.* 37, 559 (1885)), is destroyed by boiling, is non-dialyzable and accelerates the oxidation of luciferin. Luciferase has many of the characteristics of an enzyme, but is used up in the oxidation process. Its action is specific, no substance having been found which can take its place. Photophelein occurs in various extracts of luminous and non-luminous animals, including *Cypridina*. When a *Cypridina* ext. containing luciferin and luciferase is allowed to stand, the luciferin is not completely oxidized, but some of it is bound by other substances in the ext. Photophelein is able to free this bound luciferin probably by displacing it in a manner similar to saponin which will displace luciferin and luciferase from colloidal  $\text{Fe}(\text{OH})_3$  because it is more strongly adsorbed than the latter substances. The oxidation of luciferin is a reversible process involving the reaction  $\text{luciferin} \rightleftharpoons \text{oxyluciferin}$ . Oxyluciferin does not decompose when the partial pressure of O is greatly reduced. It is believed that the oxidation of luciferin to oxyluciferin is similar to that of the leuco base of methylene blue to the blue dye. The following biological substances will reduce oxyluciferin to luciferin: Bacterial or yeast cultures, ground frog muscle, milk, blood of the horseshoe crab (*Limulus*) which has been allowed to stand till bacteria develop and ext. of *Cypridina*, the latter due to the presence of reductases. Chloroform, toluene and thymol have a destructive action on these reductases. A *Cypridina* ext. will not reduce methylene blue or nitrates even in the presence of  $\text{CH}_3\text{CHO}$ , probably because the oxyluciferin present is more readily reduced and therefore is affected first. Oxyluciferin is also reduced by the following inorganic substances:  $\text{H}_2\text{S}$  (incompletely) and hydrogen from palladium black and  $\text{NaH}_2\text{PO}_2$ . Sulfur dioxide or oxides of nitrogen are ineffective. Reduction is favored by weak acids such as  $\text{H}_2\text{CO}_3$  and dilute  $\text{CH}_3\text{COOH}$ ; alkali hinders reduction. Crude luciferin and oxyluciferin are pptd. from solns. by satn. with  $(\text{NH}_4)_2\text{SO}_4$  or  $\text{MgSO}_4$ , but not by  $\text{NaCl}$ . Picric acid gives only an opalescence. They are nearly completely pptd. by phosphotungstic acid, but not by acetic acid or  $\text{CO}_2$ . Both luciferin and oxyluciferin will pass through porcelain filters and parchment or collodion membranes. They are sol. in absolute  $\text{EtOH}$ , but insol. in ether and benzene, are not digested by pepsin-HCl, Merck's pancreatin in neutral solution, or erepsin. Oxyluciferin is partially pptd. by basic Pb acetate and tannic acid. It will not reduce Fehling's, Barfoed's, Nylander's or Knapp's reagent. It apparently does not contain an aldehyde group. Cf. *C. A.* 11, 1212.

CHAS. H. RICHARDSON.

**The photic sensitivity of *Ciona* intestinals.** SELIG HECHT. *J. Gen. Physiology* 1, 147-66(1918).—*Ciona* responds to an increase in the intensity of illumination by means of a local reaction or by a retraction reflex of the body as a whole. The photosensitive area is the intersiphonal region containing the neutral mass. The reaction time to light is composed of a sensitization period of exposure to light and a latent period during which *Ciona* does not need to be illuminated in order to react to the stimulus received during the sensitization period. The duration of the reaction time varies inversely as the intensity; the latent period is constant. The relation between the sensitization period and the intensity follows the Bunsen-Roscoe law. When the animal has become adapted to darkness, the reaction time to light is at first large, then decreases till a constant minimum is reached. A photochem. system is proposed to account for the observed phenomena. This system, which involves a reversible reaction, includes a photosensitive substance and its precursor. The dynamics of the reaction follow closely the peculiarities of the photosensitivity of *Ciona*. In order to produce a reaction, a constant ratio must be reached between the amt. of sensitive substance broken down by the stimulus and the amt. previously broken down. The results of regularly repeated stimulation gave no evidence of a learning process or of the presence of a "higher behavior," but followed the requirements of the photochem. system suggested (cf. *C. A.* 12, 2097).

CHAS. H. RICHARDSON.

**Reversal of reaction by means of strychnine in planarians and starfish.** A. R. MOORE. Rutgers College. *J. Gen. Physiol.* 1, 97-100(1918).—In the marine flat-worm *Bdelloura* and in the starfish, *Asterias forbesii*, previous exposure to a 1:10,000 soln. of strychnine sulfate reverses the reciprocal inhibition on stimulation. The nervous systems of these invertebrates function like those of the earthworm and vertebrates. "It would seem that strychnine acts upon some chem. component of the neuron which is always present in synoptic structures but which also occurs in the simpler neurons of lower forms. The fact that strychnine is without this characteristic effect on such forms as medusa and sea anemone, indicates that the nervous systems of the starfish and planarian have chem. affinities with the vertebrates which the celerates do not possess."

JOSEPH S. HEPBURN.

**Natural and artificial parthenogenesis in animals.** D. WARD CUTLER. Victoria Univ. *Mem. Manchester Lit. Phil. Soc.* 62, Part 1, Memoir No. 2, 42 pp.(1918).—This review is essentially biological. However, the use of reagents in the production of artificial parthenogenesis is described and the theories based on this phenomenon are summarized. A 5 page bibliography is appended.

JOSEPH S. HEPBURN.

## 12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

**Accuracy in commercial grading of opened eggs.** M. K. JENKINS AND NORMAN HENDRICKSON. U. S. Dept. Agr., *Bull.* 391, 26 pp.(1918).—Of interest to the food chemist. Cf. *C. A.* 12, 1572, 2389.

JOSEPH S. HEPBURN.

**Growing lupines with a low alkaloid content (RÖMER) 11D., Rape straw as a paper and fodder material (HEUSER, BLASWEILER) 23.**

**Milk- and cream-ripening and pasteurizing apparatus.** W. R. NICOLL, JR. U. S. 1,285,330, Nov. 19.

**Baking-powder.** H. D. THATCHER. U. S. 1,286,145, Nov. 26. A baking-powder is formed of cream of tartar 67,  $\text{NaHCO}_3$  30, milk sugar 4 and finely powdered casein 4-10 parts.

## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**A comparison of the permanganate methods for the determination of required oxygen.** JOHN H. SACHS. *J. Ind. Eng. Chem.* 8, 404-6(1916).—This paper has been previously overlooked through an error.

E. J. C.

**Oxygen demand of sewages.** F. W. BRUCKMILLER. *J. Ind. Eng. Chem.* 8, 403-4(1916).—This paper has been previously overlooked through an error.

E. J. C.

**Softening water.** F. BLUMENTHAL. U. S. 1,285,603, Nov. 26. A  $\text{H}_2\text{O}$ -softening reagent is prepd. by pptg. an Fe compd. from a soln. of  $\text{FeCl}_3$  or other Fe salt by the action of water-glass, and, subsequently, treating the ppt. thus formed with a boiling soln. of  $\text{Na}_2\text{CO}_3$ ,  $\text{NaOH}$ ,  $\text{K}_2\text{CO}_3$  or  $\text{KOH}$  to increase its base-exchanging properties.

**Apparatus for purifying water by treatment with gases such as chlorine.** C. F. WALLACE and M. F. TIERNAN. U. S. 1,285,491-2, Nov. 19.

**Purifying sewage.** W. JONES. U. S. 1,286,017, Nov. 26. Air is used, successively, for treating sewage containing sludge in different receptacles, and accumulated "activated" sludge is used in the treatment of raw sewage. Cf. C. A. 12, 1326.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

**Soils of southern New Jersey and their uses.** J. A. BONSTEEL. U. S. Dept. Agr., *Bull.* 677, pp. 77(1918).—A detailed soil and crop survey of a number of areas in southern New Jersey. Maps are given showing the selective uses of soils for specific crops.

J. J. SKINNER.

**Critical contributions to the description of the "red earth" in the Mediterranean region.** PAUL EHRENBURG. *Intern. Mitt. Bodenk.* 6, 277(1916); *Biedermanns Zentr.* 47, 239-40(1918).—A criticism of some of E. Blanck's views (*Landw. Vers. Sta.* 87, 251(1915); *Biedermanns Zentr.* 45, 149(1916)). B. does not state whence the diffusing iron solns. come nor does he sufficiently value the influence of temp. "The contribution of material by the wind may have exerted a not unessential influence on the origin of the red earth."

ALBERT R. MERZ.

**A coating on sand grains and other fine particles which hinders wetting.** ORTO NOLTE. *Intern. Mitt. Bodenk.* 6, 347(1916); *Biedermanns Zentr.* 47, 240(1918).—The view of H. Dèvaux (*Compt. rend.* 162, 197(1916)) that the difficulty of wetting such soil particles is due to envelopment by org. matter of the nature of resin or wax is opposed. This phenomenon has been shown by P. Ehrenberg and K. Schultze (*C. A.* 9, 1142) to be due to the adsorption of air.

ALBERT R. MERZ.

**The preservation of nitrogen in liquid manure.** VOGEL. Leipzig. *Mitt. Deutsch. Landw. Ges.* 1917, p. 690; *Biedermanns Zentr.* 47, 201-3(1918).—N can be retained by mechanical contrivances or by means of chem. agents. In agr. practice  $\text{NaHSO}_4$  deserves first place as a preservative. Liquid manure preserved with it gave excellent results on meadows and with rye, potatoes and beets. Equal quantities of gypsum and bisulfate may be used to avoid the caustic action of the acid sulfate. The addition of 1 to 2% of a fluid containing formaldehyde and phenol, obtained as a by-product in the Bakelite industry, prevented loss of N in urine. Liquid manures thus treated did not injure germination in any way. A mixt. of  $\text{Na}_2\text{SO}_4$  and gypsum, obtained by the treatment of  $\text{NaHSO}_4$  with CaO, limited the loss of N from urine to 57%, urine not so treated losing 77.6% of its N.

ALBERT R. MERZ.

**Determination of the value of agricultural lime.** S. D. CONNER. *J. Ind. Eng. Chem.* 10, 996-9(1918).—The value of agricultural limes was detd. by means of (1) the acid-sol. Ca and Mg, (2)  $\text{CO}_2$  detn. with boiling HCl, and (3) by digesting in standard acid and titrating the excess acid. In pot expts. with acid soils lime minerals were found effective for crop production in the following order, the highest being placed first: Calcite, dolomite, magnesite, wollastonite, rock phosphate, serpentine, enstatite and gypsum. Soil acidity was decreased by the minerals in the following order: Magnesite, dolomite, calcite, wollastonite, serpentine, rock phosphate, gypsum and enstatite. It is stated that the results indicate that the value of agricultural lime is in accordance with its power to neutralize acid rather than its content of CaO, MgO or  $\text{CO}_2$  and that the titration method is most reliable for detg. value of lime.

J. J. SKINNER.

**Analysis of experimental work with raw rock phosphate as a fertilizer.** W. H. WAGGAMAN, C. R. WAGNER AND R. F. GARDNER. U. S. Dept. Agr., *Bull.* 699, pp. 118(1918); cf. C. A. 12, 1492.—A review of the experimental results secured with

rock phosphate as a fertilizer, especially the data secured by the state experiment stations. It is concluded that the conventional laboratory methods for detg. the availability of  $P_2O_5$  in various phosphates do not necessarily serve as an index to its availability under soil conditions. The effectiveness of raw rock phosphate depends upon the fineness of material, thorough distribution in the soil, liberal amts. and thorough cultivation. On most soils raw rock phosphate produces an increase in yield of many crops the first year. Decaying org. matter in the soil increases the effectiveness of ground rock phosphate. The response of crops to acid phosphate is quicker than to ext. basic slag or raw rock phosphate. Acid phosphate has proved superior to raw rock phosphate in most cases.

J. J. SKINNER.

**Alteration of lime-nitrogen on storage.** J. P. VAN ZYL. *Z. angew. Chem.* 31, I, 203-4(1918).—The author mentions the case of a heap of lime-nitrogen which, notwithstanding the fact that it lay in storage for  $2\frac{1}{2}$  years, remained in a remarkably fresh state. It still contained a high percentage of total N (14.64%) and more than 90% of this could be extd. with hot water. From the total N which was found in the ext., more than 75% was still present in the initial state of cyanamide and only 1.6% had been transformed into dicyanodiamide. The rest was at all events present in a form not prejudicial to plants (urea, etc.).

TH. VERHEGGEN.

**Grain-sorghum experiments in the Panhandle of Texas.** C. R. BALL AND B. E. ROTHGEB. U. S. Dept. Agr., *Bull.* 698, pp. 91(1918).—Agronomic data for the various varieties are given.

J. J. SKINNER.

**Phosphate rock in 1917 (STONE) 18.** Potassium compounds from flue dust (U. S. pat. 1,285,152) 18.

**LLOYD, S. L.: Mining and Manufacture of Fertilizing Materials and their Relation to Soils.** New York: D. Van Nostrand Co. 153 pp. \$2.00.

**SORNAY, P. DE: Traité pratique d'analyses agricoles.** Port Louis, Mauritius: Mauritius Stationery & Printing Co., Ltd.

**VON WOLZOGEN KÜHR, C. A. H.: De Microbiologie van de Bodemréductie.** Nederlandsch-Indie: Archief voor de Suikerindustrie. 60 pp.

**Fertilizer from potassium-bearing silicates and sodium phosphate.** W. GLAESER. U. S. 1,285,122, Nov. 19. K-bearing silicates such as feldspar are heated to about  $800^\circ$  and then suddenly cooled to facilitate comminution, the resulting material is ground to 100 mesh, mixed with 25% of Na phosphate and this mixt. is heated to above  $1000^\circ$  to produce a mixt. containing K phosphate.

**Treating potassium-bearing silicates.** W. GLAESER. U. S. 1,285,121, Nov. 19. K-bearing silicate is first heated in lump form to about  $800^\circ$  and suddenly cooled and then ground and the resulting finely divided material is mixed with coke and with about 30% of lime, and this mixt., after being briqueted, is heated with steam and air at a temp. above  $700^\circ$  to produce a mixt. containing  $K_2CO_3$  and suitable for use as a fertilizer.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

**Sweet white wines.** L. M. AND E. V. *Bull. soc. agriculteurs France* 1918, 241-2. —A must of 11.5° B. (containing about 200 g. sugar per l.) or more fulfills the conditions necessary for the production of semi-dry sweet white wines. The wines produced

from musts containing less sugar are not well balanced and are more subject to a second fermentation. To prepare sweet wines from musts poor in sugar, fermentation of a quantity of such must must be stopped when it reaches 5° of alc., by adding 40 g. of  $\text{KHSO}_4$  per 100 l., racking the half fermented wine several days later, and preserving it in casks in a cool place. The casks must be well fumigated with burning S before use and they must be kept full. The half fermented must is then added to a completely fermented wine in quantity ascertained by trial. The procedure of securing well balanced sweet wine from musts of 11.5° B. is described. ALBERT R. MEYER.

**Beer.** E. MONFANG. U. S. 1,286,055, Nov. 26. During a substantial part of the main fermentation, the wort is treated with 2 to 3% by vol. of yeast at a temp. of 0-6° to decompose a substantial portion of the sugar in the wort without materially affecting the albuminoids.

**Brewing.** H. BOULARD. Brit. 119,833, May 7, 1918. To dispense with malt, the wort is saccharified by means of a mucor such as the mucor Boulard No. 5 described in 25,406, 1913 (C. A. 9, 1223), the hops being added before saccharification. The grain is first boiled under pressure, organic acids being added if necessary, to break up the grains and transform the starch into sol. starch and dextrin. The pressures employed and the time of boiling depend on the kind of beer which it is desired to produce. Tartaric acid is stated to give the best results, HOAc coming next. Hops are then added, preferably in two or more stages, and boiling is continued to "break" and sterilize the wort. The wort is then transferred to another vat and cooled to 38-40°, and the saccharifying mucor is introduced. The wort is rapidly cooled to ppt. nitrogenous matters, having been previously boiled if necessary. The mucor may be introduced as a "bacteriological culture" or may be cultivated in a vat from a quarter to a tenth the size of the saccharifying vat. Fermentation may take place in the saccharifying vat or in a sep. vat as desired.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

An institute for coöperative research as an aid to the American drug industry. *J. Ind. Eng. Chem.* 11, 59-69 (1919).—Discussion of the proposed institute (cf. symposium in *Ibid* 10, 969-76) by CHAS. J. LYNN, President of the Am. Drug Manufacturers Assoc.; by A. R. L. DOHME, J. K. LILLY, WM. JAY SCHIEFFELIN, FRED B. KILMER, and CHAS. G. MERRELL, manufacturers of drugs; by H. A. B. DUNNING and A. D. THORBURN pharmaceutical chemists; by JACQUES LOEB, PAUL A. LEWIS and E. K. MARSHALL, JR., connected with research institutes and organizations; and by REID HUNT, HENRY G. BARBOUR, H. V. ARNY, HUGH MCGUIGAN, ROBERT A. HATCHER and TORALD SOLLMAN, university men. E. J. C.

**Isotonic coefficients.** WM. A. KNIGHT. *Chemist Druggist* 90, 693 (1918).—"The isotonic coefficients, *i. e.*, the numbers expressing the relative osmotic pressures exerted, by mol. proportions of the different classes of compds. in dil. soln. are as follows: Sugars, 2; K and Na salts of monobasic acids, 3; K and Na salts of dibasic acids, 4; K and Na salts of tribasic acids, 5; alk. earth salts of monobasic acids, 4." These numbers can be used in the calcn. of amts. of various substances to use in the prepn. of isotonic solns. The calcn. can also be made from the partial coeffs. of the constituents, allowing 2 for every acid radical, 1 for every atom of alkali metals, and 0 for every atom of divalent metal; *e. g.*, to calc. the amt. of  $\text{MgSO}_4$  necessary to make a soln. isotonic with a soln. of NaCl the ratio would be  $\text{MgSO}_4:\text{NaCl}::246.5:58.5::2:3$ , *i. e.*, for every 2 × 58.5 g. NaCl, 3 × 246.5 g.  $\text{MgSO}_4$  would be required. C. O. EWING.

**Derivatives and oxidation products of the alcohols of the paraffin series found in essential oils.** C. T. BENNETT. *Perf. Essent. Oil Record* 9, 115-7(1918).—A compilation of their occurrence and properties. C. O. EWING.

**Estimation of pulegone and other ketones in oil of pennyroyal.** C. T. BENNETT. *Perf. Essent. Oil Record* 9, 208(1918).—The neutral sulfite process is the only practical method at present known for the estn. of ketones in oil of pennyroyal; the results include both pulegone and menthone. Expts. have shown that the absorption in the case of oil of pennyroyal is much slower than in the cases of dill and caraway oils and that instead of 1 hr. of shaking, at least 3 hrs. is required to obtain good results. An oil showed 44% ketones after 1 hr., 58% after 2 hrs., and 82% after 3 hrs.; another showed 50% after 1 hr. and 88% after 3 hrs. Parry's statement that oil of pennyroyal contains at least 80% of ketones is thus confirmed. C. O. EWING.

**Chemistry of the constituents of volatile oils.** C. T. BENNETT AND C. HOLLINS. *Perf. Essent. Oil Record* 9, 128-62(1918).—"A summary of our present knowledge of the terpenes and their derivs." I. Aliphatic series: (a) Terpenes, (b) Terpene alcs., (c) Terpene aldehydes and ketones, (d) Sesquiterpenes, (e) Sesquiterpene alcs, (f) Sesquiterpene ketones. II. Bicyclic terpenes. III. Monocyclic terpenes (menthadienes). IV. Terpenes of the meta series. V. Terpene alcs. and ethers. VI. Bicyclic terpene ketones. VII. Monocyclic terpene ketones. The paper contains 19 tables of phys. properties of terpenes and derivs. and 123 graphic formulas. C. O. EWING.

**Can *Gentiana asclepiadea* L. be used as a substitute for *Gentiana lutea*? O. HOYER AND R. WASICKY. *Pharm. Post* 51, 145-6(1918); *Chem. Zentr.* 1918, I, 940-1.—*Gentiana asclepiadea* contained only half as much gentiopicrocin as is reported for *G. lutea*. Organoleptic tests also showed that the latter is twice as bitter as the former; consequently when used as a substitute for *G. lutea* twice as much drug is required. Gentiopicrocin has no therapeutic activity against malaria. C. O. EWING.**

**Occurrence of allantoin in rhizome of *Symphytum officinale* and other Borraginaceae.** ALFRED VOGL. *Pharm. Post* 51, 181-4(1918); *Chem. Zentr.* 1918, II, 36.—Allantoin crystals were found in the tissue of cross sections of the rhizome of *Symphytum officinale*. Directions are given for their identification. The crystn. occurs best when a section is mounted in EtOH to which 20% of glacial AcOH has been added, and the cover glass is sealed with paraffin. The allantoin content varies with the season, being highest through the winter and lowest in the summer. None was found in *S. tuberosum*, *S. cordatum*, *S. caucasicum* and other Borraginaceae. C. O. E.

**Stability of digitalis preparations of commerce.** RAPP. *Pharm. Zentr.* 58, 479-81 (1917); *Chem. Zentr.* 1918, I, 231-2.—*Rana temporaria* is superior to *R. esculenta* for testing digitalis preps. All samples to be tested should be evapd. to dryness on a water bath and taken up in 25% alc.; all dilns. should also be made with 25% alc. The test should be carried out by always injecting 0.015 cc. of soln. per 1 g. of body wt. of frog, the concn. of the soln. being suitably varied. A number of German comm. preps. showed a high degree of stability. Cf. C. A. 9, 1527. C. O. EWING.

**Lt.-Col. E. F. Harrison.** *Nature* 102, 210-1(1918).—Obituary. A. R. M.

**RUMI, T. J. AND BERNAOLA, V. J.: *Física farmacéutica*.** Vol. I. 216 pp. For review see *Anales soc. quim. Argentina* 6, 465 (1918).

**STEWART, F. E.: *A Compend of Pharmacy*.** 9th Ed. Revized and enlarged by Heber W. Youngken. Philadelphia: P. Blakiston's Son & Co. 196 pp. \$1.50.

**STICK, CONRAD: *Bakteriologie und Sterilization im Apothekenbetriebe*.** 3rd Ed. Berlin: Julius Springer. 326 pp. M. 14.

**Phenylethylhydantoin.** L. HERMANN. U. S. 1,285,703, Nov. 26. Phenylethylhydantoin,  $\text{PhEtC.NH.CO.NH.CO}$ , is made by reacting upon phenylethylcyano-

acetamide with  $\text{NaOBr}$  soln. It is colorless, m.  $198^\circ$ , is insol. in  $\text{H}_2\text{O}$ , easily sol. in hot acetone, alc. and glacial  $\text{HOAc}$  and forms alkali metal salts which are sol. in  $\text{H}_2\text{O}$ . It may be used as a hypnotic.

**Lecithin.** H. MARTIN. Holl. 2,583, Sept. 5, 1918. Albumin is treated with hot alc. to break down the lecithin compds., and mixed, if necessary, with binders such as sugar or flour, together with substances to flavor the product, such as chocolate or vanilla, and also with a small amt. of alc.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The work of the Technical Division, Chemical Warfare Service, A. E. F. COL. RAYMOND F. BACON. *J. Ind. Eng. Chem.* 11, 13-15(1919).—A statement of the organization of the Division and a brief discussion of its work. E. J. C.

Gas offense in the United States. A record achievement. CHAS. H. HERTY. *J. Ind. Eng. Chem.* 11, 5-12(1919).—An illustrated survey of the organization and remarkable accomplishments of the chemists who so creditably developed and handled this phase of our country's warfare program. Brief descriptions of the properties and manuf. of *phosgene*, *chloropicrin* and *mustard gas* are included. E. J. C.

Some developments in industry during the war. F. KELLAWAY. *Electrician* 81, 669-70(1918).—"The United Kingdom is now first in almost every sphere of industrial effort." Comments on the mica, W, ferrochrome, Zn,  $\text{K}_2\text{O}$  and scientific glassware industries. C. G. F.

The war and the nitrogen industry. W. S. LANDIS. *Chem. Met. Eng.* 19, 828-30(1918). E. J. C.

Recent developments in the organization of national industrial research institutions. GERALD LIGHTFOOT. Commonwealth of Australia, Advisory Council of Science and Industry, *Pamphlet* No. 1, 23 pp.(1918). E. J. C.

Technical questions for works-chemists. RUDOLF KAESBOHRER. *Chem. Ztg.* 42, 2-4, 26-27, 42-3, 55-6, 68-9(1918).—The author discusses concisely the points of the technical sciences which are especially important for works-chemists.

TH. VERHEGGEN.

The establishment of new industries. H. W. GEPP. *Chem. Eng. Mining Rev.* 11, 54-5(1918).—A full abstract of a paper read before the Soc. of Chem. Ind. of Victoria. E. J. C.

Chemical markets of the West Indies. O. P. HOPKINS. *J. Ind. Eng. Chem.* 11, 19-26(1918). E. J. C.

Alsace-Lorraine and German industry. ANON. *Engineering* 106, 561-2(1918).—This discussion is of some interest to chemists because of the iron ore, potash and petroleum deposits of this region. E. J. C.

Indication of the place of manufacture and chemical industry. P. PETIT. *Chimie & industrie* 1, 688-90 (220-2E)(1918).—A discussion of the use of labels such as "Made in Germany" on products of manufacture. E. J. C.

Magnesium in 1917. RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of the U. S.*, 1917, Pt. I, 147-51. (Preprint No. 10, published Dec. 11, 1918.)

E. J. C.



**The Alsatian potash mines and works.** ANON. *Chem. Trade J.* 63, 419-20 (1918).—Both French and German views of the situation and the problems involved are given.  
E. J. C.

**The fluor spar market and the local supply.** A. I. SWERTSER. *Eng. Mining J.* 106, 1031-2 (1918).—Production, com. uses, prices and industrial requirements are discussed.  
E. J. C.

**Phosphate rock in 1917.** With notes on phosphorus. RALPH W. STONE. U. S. Geol. Survey. *Mineral Resources of the U. S. 1917*, Pt. II, 7-18 (Preprint No. 3, published June 25, 1918).  
E. J. C.

**The works of the Australian Oxygen Co.** ANON. *Chem. Eng. Mining Rev.* 11, 52 (1918).—Descriptive.  
E. J. C.

**The economical production of 53° B<sub>é</sub>. sulfuric acid from sulfur dioxide.** ALBERT HUTIN. *Rev. prod. chim.* 21, 275 (1918).—To produce 53° acid, SO<sub>2</sub> is bubbled through either 60-62° H<sub>2</sub>SO<sub>4</sub> or the ordinary mixt. of 50° acid and HNO<sub>3</sub>, or water. The app. used consists of 7 parts. First, the purifier, which consists of a volvic lava chamber lined externally with sheet Pb, and divided internally into 2 superimposed compartments by a volvic lava plate, pierced with openings, each one having a stoneware tubulure, 18 cm. in diameter, covered by cap. SO<sub>2</sub> enters through these tubulures, bubbling through a layer of 50° acid, 5 mm. thick. This serves to remove all dust from the gas. The gas, leaving the purifier, encounters the nitrous gases, produced in the second part of the app., the nitrous gas generator. This is a chamber in which are placed cylindrical iron pots, enclosed in sheet-iron casings, heated individually. The pots can be easily removed, cleaned and recharged with acid and niter. The mixed gases now enter the third part of the app., known as the condenser-concentrator. This is a cylindrical tower of the Glover type, but without any interior packing, 7 m. high and 1.5 m. in interior diameter. The lower half is made of volvic stone lined externally with sheet lead, while the upper half is of lead, so that the hot gases entering the tower are not destructive to it. The tower is divided into sections by twelve plates, containing openings covered with caps. A mixt. of 50° H<sub>2</sub>SO<sub>4</sub> and nitrous acid flows down the tower, meeting the SO<sub>2</sub>, which is transformed into H<sub>2</sub>SO<sub>4</sub>. 62° acid is obtained. This acid collected in coolers, where it is cooled from 140-160° to 15°. The gases coming from the condenser-concentrator pass through a separator, in which weak H<sub>2</sub>SO<sub>4</sub> is circulated and a further recovery of 53° H<sub>2</sub>SO<sub>4</sub> is made. The gases then pass through another tower where 50° H<sub>2</sub>SO<sub>4</sub> is obtained and finally through a Gay-Lussac tower.

ISMAR GINSBERG.

**Graph for acid mixing.** E. C. CRAVEN. *Chem. News* 117, 217-8 (1918).—In establishments where H<sub>2</sub>SO<sub>4</sub> is used largely and where mixts. of oleum and C. O. V. are frequently made, a simple device is suggested for detg. graphically the proportions of the two acids to use to obtain an acid of given concn. The device consists of a wooden panel sliding between two scales, one for oleum in % SO<sub>3</sub> and the other for C. O. V. in % H<sub>2</sub>SO<sub>4</sub>, whereby it is possible to read off the desired quantities directly.

ISMAR GINSBERG.

**A new bleaching powder for use in hot climates.** T. J. RETTIE, J. L. SMITH and J. RITCHIE. *J. Soc. Chem. Ind.* 37, 392R (1918).—At 37° bleaching powder loses 96% of its available Cl in 8 weeks, and at 45° the same loss occurs in 2 weeks. The loss is due to the moisture contained in the powder. By mixing freshly burnt quicklime with com. bleaching powder, to the extent of 10-15% excess over the amt. calcd., the keeping qualities are much improved, and there is a decreased tendency toward the formation of Ca(ClO<sub>3</sub>)<sub>2</sub>. 70 parts of bleaching powder with 34% available Cl and 9.7% H<sub>2</sub>O were mixed with 30 parts of quicklime and the dry mixt. tested 23% available Cl.

A sample kept in a sealed tube for 15 weeks at 45° tested 22% available Cl. There was 0.52% chlorate at the start and 1.2% at the finish of the expt. R. B. ROZ.

**Annual Report of the Society of Chemical Industry on the Progress of Applied Chemistry.** London: Harrison & Sons. Vol. II. 537 pp. 6s. 6d. Cf. C. A. 12, 407.

DUBREISAY, RENÉ: *La chimie élémentaire des ingénieurs, des industriels et des constructeurs.* Paris: Dunod et Pinat. 307 pp. 10 fr.

**Mineral Industry for 1917.** Vol. XXVI. Edited by G. A. Roush and A. Butts. New York: McGraw-Hill Book Co. 928 pp. \$10.00.

**Phosphoric acid.** W. H. ALLEN. U. S. 1,285,575, Nov. 26. In the manuf. of  $H_3PO_4$  a mixt. of fuel, phosphates and  $SiO_2$  is conveyed into a combustion chamber containing  $H_2O$  vapor, by means of a blast of air. The mixt. used may, *e. g.*, be composed of phosphate rock, sand and coke.

**Sulfuric and hydrochloric acids.** H. V. WELCH. U. S. 1,285,856, Nov. 26.  $SO_2$ , Cl and  $H_2O$  vapor are caused to react at such a temp. (preferably about 230°) as to produce  $H_2SO_4$  in vapor form in mixt. with HCl gas and the resulting mixt. is cooled to such a temp. as to effect condensation of substantially all the  $H_2SO_4$  at a definite concn., depending on the temp. of condensation, in the form of finely divided suspended particles and the latter are then pptd. electrically to sep. them from the HCl. When condensation is effected in stages,  $H_2SO_4$  of a strength of about 95% is obtained in the initial condensation.

**Apparatus for concentrating sulfuric acid.** J. PATTEN. U. S. 1,286,080, Nov. 26. Acid to be concd. is fed successively through a series of Pb-lined chambers which are heated interiorly by steam coils and in which a vacuum is maintained to distil off the  $H_2O$  at a low temp. The pat. relates especially to the construction for supporting the upper part of the Pb lining to prevent its premature deterioration. U. S. 1,286,188 relates to a generally similar app. for the same purpose.

**Alkalies and alumina from feldspar and similar minerals.** F. A. RODY. U. S. 1,285,796, Nov. 26. Feldspar, leucite or a similar mineral or rock is first treated with a basic alkali compd., such as  $K_2CO_3$  or KOH, to combine with the silicate a greater proportion of alkali than that naturally present and the product is heated to a sintering temp., together with CaO or  $CaCl_2$  in proportion to form orthosilicate of Ca and at the same time to form a  $H_2O$ -sol. combination of the alkali and alumina.

**Alkali chromates.** SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES. Brit. 119,647, Jan. 25, 1918. Crude alkali chromates, or alkali chromate fusion products, with or without the addition of a reagent such as chalk, and in presence or absence of  $H_2O$ , are freed from alkali hydroxides by extg. the hydroxides with an org. solvent such as Et or Me alc. or acetone, which is afterwards distd. off. Any alkali ferrite present may be destroyed by the action of steam before or after the treatment with the solvent. Alkali hydroxides, carbonates, aluminates, or silicates are removed from the chromates by the action of  $CO_2$ , in presence or absence of  $H_2O$ , the products of decompn. of the impurities being insol. while the chromates are unchanged. It is stated that the 2 treatments may be combined.

**Bismuth salts.** N. BUSVOLD. Brit. 119,659, Sept. 30, 1918. Bi salts are sepd. from impurities commonly associated with Bi and Bi is obtained in soln. and may be recovered in the metallic form by pptn. with Zn, by reduction of the oxychloride or by electrodeposition. A Bi ore may be dissolved in HCl and the metals completely pptd. by  $H_2S$ , the ppt. being then treated with a further quantity of the crude soln. which

produces a pure soln. of  $\text{BiCl}_3$ , leaving the As, etc., as sulfide. When a  $\text{Bi}_2\text{S}_3$  ore is treated with an acid ( $\text{HCl}$ ,  $\text{HF}$ , or other acid) the evolved  $\text{H}_2\text{S}$  may be used to effect the pptn. of the crude sulfide. The sulfide ore may be completely dissolved in acid, the soln. being then treated with more of the ore or with another sulfide. As sulfide will then be first pptd. Or a quantity of  $\text{Bi}_2\text{S}_3$  ore may be treated with less than enough acid to dissolve it, when a Bi salt is obtained, leaving As sulfide undissolved.

**Nitrates from sulfides and nitric acid.** W. O. SNELLING. U. S. 1,285,824, Nov. 26.  $\text{Ba}(\text{NO}_3)_2$  is prepd. by spraying  $\text{HNO}_3$  into a soln. containing BaS, spreading the mixt. into thin sheets and maintaining sub-atmospheric pressure above the liquid to remove  $\text{H}_2\text{S}$  as fast as formed. Other nitrates such as  $\text{Sr}(\text{NO}_3)_2$  may be similarly prepd. from the corresponding sulfides. Removal of  $\text{H}_2\text{S}$  avoids reduction of  $\text{HNO}_3$  and consequent formation of  $\text{NH}_4\text{NO}_3$ .

**Magnesium carbonate.** B. B. GRUNWALD. U. S. 1,285,683, Nov. 26. Light  $\text{MgCO}_3$  is prepd. by sepg. dead burned magnesite from light calcined magnesite by sedimentation in  $\text{H}_2\text{O}$  and then carbonating the hydrated magnesia.

**Potassium compounds from flue dust.** E. W. HASLUP. U. S. 1,285,152, Nov. 19. Crude K compds. suitable for use in fertilizers are extd. from flue dust containing K sulfides and silicates by treating the dust with a soln. of  $\text{MgCl}_2$  to decompose the K sulfides present and to ext. the sol. K compds. and then digesting the residue with hydrated  $\text{CaSO}_4$  to convert the K silicates into sulfates. The process is especially adapted for treating elec. pptd. dust from cement kilns.

**Xylolith.** E. WALLIN. Swed. 43,761, Mar. 6, 1918.  $\text{Mg}(\text{NO}_3)_2$  is employed, instead of  $\text{MgCl}_2$  or  $\text{MgSO}_4$ , in the manuf. of xylolith.

**Hydrogen.** C. T. THORSSELL and H. L. R. LUNDEN. Brit. 119,591, Jan. 9, 1918. In the manuf. of H by alternately oxidizing and reducing Fe by steam and reducing gas, resp., the Fe material used is impregnated with compds. of alkali metals in order to retain the activity of the Fe. E. g., Fe sponge may be soaked in a strong soln. of  $\text{NaOH}$  or  $\text{Na}_2\text{CO}_3$  and then dried, or the Fe sponge may be pulverized, mixed with  $\text{Na}_2\text{CO}_3$  and  $\text{H}_2\text{O}$ , pressed into small briquets, and dried.

**Purifying and drying hydrogen.** C. A. PFANSTIEHL. U. S. 1,286,088, Nov. 26. The pat. relates especially to an app. which is designed for purifying excess H which has become slightly contaminated with O and  $\text{H}_2\text{O}$  vapor generated in reduction of  $\text{WO}_3$  by H.  $\text{CaCl}_2$  is used to remove  $\text{H}_2\text{O}$  and hot Cu may be employed for removing the O from the H, which may then be re-used, in a cyclic system, for reducing a further portion of  $\text{WO}_3$ .

**Extracting iodine and other chemical products from seaweeds by dry distillation.** J. A. W. BREDEBERG. Can. 187,721, Dec. 3, 1918. Iodine, etc., are extd. from seaweed by dry distn. in a closed retort. The gases are passed through a condenser and the uncondensed gases are passed through a metal salt which will absorb the volatile I and Br. The residue in the retort is soaked with water and the dissolved salts are sepd.

**Sulfur in globular form.** R. P. PERRY. U. S. 1,285,358, Nov. 19. S in the form of small, globular bodies is prepd. by fusing (e. g., the S of subterranean S deposits by the action of superheated  $\text{H}_2\text{O}$ ) and then, before the fused S has become solidified, injecting it in the form of a spray into a cooling medium such as air.

**Decolorizing carbon.** R. W. MUMFORD. U. S. 1,286,187, Nov. 26. A material suitable for use in decolorizing sugar solns. or other liquids is formed by slowly and gradually heating a mixt. of moist vegetable material such as peat with granular dolomite and  $\text{MnO}_2$ , first to dry and harden and then to char the material; a max. temp.

of above  $600^{\circ}$  is employed at the end of the heating. The product is a fine-grained C of rapid decolorizing action. Sawdust, bark or wood pulp also may be used.

**Extracting oils, pyridine, etc.** V. Z. REED. Brit. 119,648, May 17, 1918. Oils and other hydrocarbon products, N bases, *e. g.*, pyridine and the like, are extd. from shales, coal, etc., by treating the shale, etc., prior to destructive distn. with the vapors, which may be partially condensed, obtained by the distn. process, and in the presence of an acid added or obtained by distn. The condensation of the vapors is completed in passing through the shale, and the hot condensed liquid dissolves part of the oil, etc., from the shale and this is sepd. from the solid material prior to the feeding of the material to the distn. retort. A suitable app. is specified.

**Cleaning metals.** J. H. GRAVELL. Brit. 119,618, Mar. 22, 1918. A compn. for cleaning Fe and steel for painting consists of  $H_3PO_4$ , alc., and  $Ca_3(PO_4)_2$ . When a freely flowing compn. is required,  $H_2O$  is added. The compn. is especially designed for cleaning metals which have been treated with strong acids. The  $Ca_3(PO_4)_2$  may be replaced by other phosphates such as those of Mg or Ba. Cf. C. A. 12, 1761.

**Impregnating porous material with waxy substances.** R. W. E. MOORE. U. S. 1,286,057, Nov. 26. In forming dielectric material from cloth, paper, wood or other porous material, the latter is moistened with  $H_2O$  and then immersed in the waxy impregnating material, *e. g.*, asphalt, heated to above  $100^{\circ}$ .

**Electrical insulating material.** L. McCULLOCH. U. S. 1,286,043, Nov. 26. Elec. insulation suitable for use in elec. heating app. is formed by coating flakes of mica with a coat of bentonite and  $H_2O$  and pressing and drying the material.

**Electrical insulating composition.** J. ANDERSEN. U. S. 1,285,889, Nov. 26. An insulating compn. suitable for use on cables is composed of powdered talc 50, resin 4 and linseed oil 10%. Shellac also may be used as a binder.

**Adhesive from corn-cobs.** F. B. LAFORGE. U. S. 1,285,247, Nov. 19. Corn-cobs are heated under pressure with  $H_2O$  to cause sepn. and soln. of colloidal matter and the colloidal soln. is sepd. from the residue of insol. materials by pressure and then concd. to a thick sirup, which is adapted for use as an adhesive. The pat. is dedicated to the public for free use.

**Aluminium carbide from aluminium silicates.** I. HØY. Norw. 28,212, Sept. 24, 1917. Silicates are treated at a high temp. in the elec. furnace with  $CaC_2$  in the proportion required for the production of the carbide.

**Compounds of oxygen and nitrogen.** O. GALLARDER and E. PRYTZ. Norw. 28,210, Sept. 24, 1917. A mixt. of O and N is compressed under a pressure of 50 atm., and heated by an incandescent body.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

The occurrence of high-grade American clays and the possibility of their further development. H. RISS. *J. Am. Ceram. Soc.* 1, 446-67(1918).—The chief imports have been in glass-pot, crucible and enamel clays from Central Europe, and china and ball clays from England. The present investigation of clay deposits covers the U. S. east of the Mississippi River and parts of Arkansas and Missouri. The study is more geologic than technologic, but practical applications are kept in mind. The various clay deposits of all kinds are described under 5 headings: Atlantic Coastal Plain belt Embayment Area, Piedmont plateau, Coal Measures region, and Missouri flint clay areas. The outlook for further development of American clay deposits is good. Most,

if not all, of the imported clays may be duplicated at home. Where one clay is not satisfactory a blending of two or more may be successful. C. H. KERR.

**Newcomb pottery.** MARY G. SHEERER. *J. Am. Ceram. Soc.* 1, 518-28(1918).—A history and description of the pottery at Newcomb college. The mat glaze most largely used is 0.6 PbO, 0.4 CaO, 0.35 Al<sub>2</sub>O<sub>3</sub>, 1.00 SiO<sub>2</sub> and a good Sn glaze is 0.7 PbO, 0.2 CaO, 0.1 ZnO, 0.15 Al<sub>2</sub>O<sub>3</sub>, 1.75 SiO<sub>2</sub>, 0.3 SnO<sub>2</sub>. Local Louisiana clays are used for body and sagger mixts. Formulas and methods of working are given.

C. H. KERR.

**Preparation and application of enamels for cast iron.** HOMER F. STALEY. *J. Am. Ceram. Soc.* 1, 534-55(1918); cf. *C. A.* 12, 2117.—A detailed description.

C. H. KERR.

**Antimony oxide as an opacifier in cast-iron enamels.** J. B. SHAW. *J. Am. Ceram. Soc.* 1, 502(1918).—The price of SnO<sub>2</sub> is almost prohibitive; since Sb<sub>2</sub>O<sub>3</sub> is equal to SnO<sub>2</sub>, pound for pound, as an opacifier, enamel cost can be reduced about 50%. The only difficulty in using Sb<sub>2</sub>O<sub>3</sub> is in getting good colors. Three series embracing 66 trials are described. *Conclusions:* To produce satisfactory colors in Sb<sub>2</sub>O<sub>3</sub> enamels: (1) use only the purest white Sb<sub>2</sub>O<sub>3</sub>, (2) use a little CaF<sub>2</sub>—not over 5%, (3) maintain oxidizing conditions during smelting—use plenty of NaNO<sub>3</sub>, (4) control color by adding Fe<sub>2</sub>O<sub>3</sub>, MnO<sub>2</sub> and PbO, (5) use Na<sub>2</sub>AlF<sub>6</sub> in small amt.—up to 3% (larger amts. are unsatisfactory), (6) weigh carefully, mix thoroughly and smelt carefully.

C. H. KERR.

**Silica refractories.** DONALD W. ROSS. *J. Am. Ceram. Soc.* 1, 477-501(1918).—Most SiO<sub>2</sub> bricks are made from quartzites of early geologic age and the most suitable are those which range from the slightly porous to the highly metamorphosed impervious rocks with tightly interlocking grains. In thin section under the microscope these quartzites show interstitial impurities (like Fe<sub>2</sub>(OH)<sub>4</sub>) appearing as sharply defined lines between the tightly interlocking SiO<sub>2</sub> grains. Quartzites which crush chiefly along the interstitial lines are apt to yield bricks of higher porosity than those that crush by breaking through the original grains. The porosity of the finished SiO<sub>2</sub> brick depends primarily upon that of the unburned mixt. Heating brick containing large % of unchanged quartz to over 1350° causes undue expansion and gives a punky product, while holding at 1250 to 1350° until conversion is largely accomplished and then raising gradually to higher temps. gives a brick of low porosity and low sp. gr. Sp. gr. is the most important test, but for a comprehensive study detn. should be made of porosity, cold cross-breaking strength, softening temp., load test and microscopic appearance. *Discussion:* R. M. HOWE said one manufacturer controlled burning as follows: burning is stopped when draw trials show 2.40 sp. gr. As the kiln is held the bricks undergo further transformation and when drawn show sp. gr. below 2.38. Chem. compn. is of secondary importance and present data do not justify setting limits for any one impurity. Usually total impurities run from 4.0 to 6.5% If SiO<sub>2</sub> = 94% or more the compn. is satisfactory without reference to any other ingredient.

C. H. KERR.

**Corrosive action of flue dust on firebricks.** WALTER EMERY. *Gas World* 69, 231(1918); *Iron and Coal Trades Review* 97, 460(1918).—The corrosive effects of dust on firebricks are discussed together with the method and app. used in the expts. Abnormal and deleterious conditions were simulated without its being possible, however, to express the results in a quant. manner by wt., measurement, or by graphic diagrams. Analyses of both firebricks and dusts are given. Results of tests show that in general the penetration by the dust is greater in fireclay than in silica brick. In most cases the bond is attacked first and coarser grains last. In silica bricks the depth of penetration is generally less the finer the grain. In the fine-grained bricks the coarser grains and

the bond are both attacked, while in the coarse-grained bricks the bond alone is attacked to any serious extent. It therefore follows that the bond of a silica brick offers the feeblest resistance against a corrosive slag. Under oxidizing conditions iron oxide does not corrode silica bricks to any noteworthy extent, but under reducing conditions ferrous silicate forms and acts as a corrosive flux. In the trials with "bull dog" the silica bricks were far less attacked than the fireclay bricks and generally the iron oxides corrode the fireclay bricks more than the silica bricks. The dusts apparently exert an influence on the conversion of the quartz into the low sp. gr. forms even where the coarse grains have apparently not been penetrated. There is also some evidence that contact with iron oxide in oxidizing flame hastens the conversion of quartz.

J. L. WILEY.

**A pycnometer operated as a volumeter.** H. G. SCHURECHT. *J. Am. Ceram. Soc.* 1, 556-9(1918).—The Seger volumeter is too slow, too difficult to operate and too fragile. A simple form made and operated like a pycnometer is described.

C. H. KERR.

**Design of porcelain insulators from the ceramic standpoint** (GILCHRIST, KLINE-FELTER) 4.

ESCARD, J.: *La nouvelle industrie du verre*. Grenoble, 23 Grande Rue: J. Rey. 120 pp. 5 fr. 40.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Combustion characteristics of coals.** J. G. WORKER. *Elec. Rev. West. Elec.* 73, 849-52(1918).—The type of stoker equipment chosen depends upon load conditions, available coal, draft and conditions of application. For buckwheat anthracite, the overfeed or inclined underfeed types of stoker are best. For mixed coal, up to 50% anthracite, an elaborate mixing scheme is essential and the boiler efficiency drops with increase of anthracite. Eastern semi-bituminous and bituminous coals lend themselves to the overfeed, inclined underfeed and some forms of single retort underfeed type; so the selection depends upon load conditions. Tables show percentage of boiler rating during test, the duration of the test, pounds of coal per sq. ft. grate per hour, CO<sub>2</sub> %, percentage of boiler-, furnace-, and grate-efficiencies based on dry coal, the B. t. u. and temp. of flue gases during combustion of various types of coal. Coke breeze is best burned on a flat grate with medium pressure under the grate. Western lignite is easily handled while that from Texas does not burn satisfactorily with any type of mechanical stoker.

W. H. BOYNTON.

**Reducing difficulties in burning Iowa coal.** T. A. MARSH. *Elec. World* 72, 1166-8(1918).—Iowa coal is bituminous and non-coking and contains high percentages of ash of low m. p. Typical analyses of screenings are given. The chain-grate stoker is best. Extreme width and breadth are needed to provide max. grate area. An extreme amt. of reflecting brickwork and arch insures combustion temps. A typical installation burns Iowa coal at the rate of 175 kg. per sq. m. of grate hourly. Analysis: Moisture 14.05%, volatile matter 31.92, fixed C 28.82, ash 25.21, B. t. u. (dry basis) 9,192. With the same setting coal has been burned at the rate of 146 kg. per sq. m. which shows on analysis: Moisture 11.65%, volatile matter 29.00, fixed C 26.75, ash 32.60, B. t. u. (dry basis) 8,085. A furnace of extreme design with reversed arch to reflect heat and gases forward burns coal showing on analysis: Moisture 19.03%, volatile matter 25.02, fixed C 22.23, ash 33.72, B. t. u. (dry basis) 6,576. Addition of

water some hrs. previous to combustion diminishes sifting through the grate, makes the fuel bed more compact, and the steam generated cracks open pieces of coal, aiding quick combustion. When ash equals 25%, its discharge should be continuous and liberally proportioned. Large grate areas, high draft and long arches are necessary. Existing settings may be improved by application of these principles.

W. H. BOYNTON.

**Exact data on the running of steam boiler plants.** I. D. BROWNLIE, J. COMPTON AND H. W. ROYSE. *Engineering* 106, 481-2 (1918). E. J. C.

**Use of coal in pulverized form.** H. R. COLLINS. *Bull. Am. Inst. Mining Eng.* 1918, 1678-84, 1771-4; cf. C. A. 12, 1344.—A discussion. J. L. W.

**Low-temperature distillation of Illinois and Indiana coals.** G. W. TRAER. *Bull. Am. Inst. Mining Eng.* 1918, 1695-6, 1783-5; cf. C. A. 12, 2426.—A discussion. J. L. W.

**Carbocoal.** C. T. MALCOLMSON. *Bull. Am. Inst. Mining Eng.* 1918, 1686-92; cf. C. A. 12, 1594.—A discussion. J. L. W.

**Economic position of the gas industry (in Germany).** E. KORTING. *Gas J.* 144, 462-3 (1918). E. J. C.

**The Wallasey Corporation gas-works. A brief history and description.** J. H. CROWTHER. *Gas J.* 144, 568-9 (1918). E. J. C.

**Dry-gas producer.** MAX BRAÜTIGAM. *Stahl u. Eisen* 38, 786-9 (1918).—This dry-gas producer is a tapping producer fed with coke. For slagging the coke ashes basic Martin slags or other slags rich in iron are used, from which pig-iron with a high % of Mn and P is obtained. The dry-gas producer differs from other tapping producers for gasification of coke in that it has neither steam supply nor hearth heating. The dry-gas producer may, in construction, be considered as a small blast furnace (half-blast furnace), in which, however, no part of the CO generated is used for the reduction of iron ores; all the CO is used as fuel for metallurgical or other purposes. A reduction, by CO, of the O compds. which are present in the slag additions does not take place because iron (as Martin or other slag) enters into the producer in an already slagged state. A consumption of CO by reduction of this metallic oxide and a partial transformation into CO<sub>2</sub> consequently does not occur, as also is shown by the small % of CO<sub>2</sub> (0.3 to 0.7%) in the gas. The sepn. of metals from the silicates by means of solid C occurs so extraordinarily rapidly that the use of the mentioned slags instead of other additions may be looked at as a great advantage. The temps. are the same as in blast furnaces. The use of P additions prevents the freezing of the generated P-Fe alloy because of its low point of solidification. A concise description is given of the producer. Slag and metal are tapped off at regular intervals. The producer lasts 13 months; after this time the hearth must be replaced. Throat and bosh are not so strongly corroded and repairs are not so often necessary. *Products of the dry-gas producer:* (1) *The dry gas* is distinguished by a very high content of CO (32.4 to 33.7%), a very low content of CO<sub>2</sub> (0.3-0.7%), and a very low % of moisture (12 g. per m<sup>3</sup>). The calorific value amounts to 1100-1186. The compn. of the gas must be considered to be favorable to the obtainment of a high temp. of combustion, for the combustible part of the gas consists almost entirely of CO (32.4-33.7%), (H<sub>2</sub> = 0.00-0.64% and CH<sub>4</sub> = 0.99-1.79%); the percentage of moisture is very small. The dry gas is practically tar-free—1 kg. coke with 88% C gives 5 m<sup>3</sup> gas—the S content amts. to 0.280%. (2) *The iron:* By the gasification in the dry-gas producer, almost all the iron contained in the added slags and coke ashes is extracted (per ton coke 16.6-43 kg. iron). This iron has a high Mn and P content (Mn = 8.44-10.48; P = 6.85-11.46). (3) *The tapping slag:* The tapping slag was good com-

paratively thin liquid, the color was yellowish green, rarely gray; the structure usually stony, rarely vitreous. It contained only 1-2.5% Fe and 2.7% Mn.

TH. VERHEGGEN.

**Influence of quality of gas and other factors on the efficiency of gas-mantle lamps.** R. S. MCBRIDE, W. A. DUNKLEY, E. C. CRITTENDEN AND A. H. TAYLOR. *Bur. Standards, Tech. Paper* 110, 49 pp.(1918); *Gas Age* 42, 468-70, 519-21(1918).—This paper discusses the various conditions such as gas quality, gas pressure, gas adjustment and air adjustment, which affect the operation of mantle lamps, and describes the methods and app. employed to control these variables and study their sep. effects. The results obtained are given and their application to practical operation is touched upon. Comparisons are made between lean water gas, city rich mixed gas, lean coal gas, and a benzolized city gas in lamps of standard types. These conclusions are drawn: (1) A given fluctuation in gas quality produces less change in the efficiency of operation of lamp with lean gas than with rich gas. (2) If a lamp is adjusted for max. c. p., an increase in the heating value of the gas supplied to it produces a decrease in efficiency; and a decrease in the heating value produces an increase in efficiency. J. L. W.

**Coke handling at Manchester Corporation gas works.** GEORGE FREDERICK ZIMMER. *Engineering* 106, 367-70(1918).—Z. describes the "Ideal" hot-coke handling machine manufd. by Drakes, Ltd., of Halifax. In construction it resembles an inclined elevator or skip-hoist with one bucket. It is so constructed that hot coke or dust never comes in contact with moving parts. The operation is efficient and economical. J. L. W.

**Inclined retort plant at Rome a success.** S. BENT RUSSELL. *Gas Age* 62, 463-6 (1918).—A description of a recently made installation of 5 inclined benches of 6 retorts each of the Parker-Russell type, fully equipped with up-to-date appliances. The plant has a creditable record for economy and efficient operation. J. L. WILEY.

**Apparatus (Poetter type) for the treatment of gas-liquor containing ammonia to obtain ammonium sulfate.** HEINRICH BORNGRÄBER. *Chem. App.* 5, 17-9(1918).—The app. is described and its operation explained. The calcn. of the economy of the work is established. Sketches are included. TH. VERHEGGEN.

**Distillation of tar from Mond gas plant.** A. GATLEY LYON. *Chem. Eng. Mining Rev.* 10, 19-20(1918).—At the Mond gas plant installation at the Sulphide Corporation Works, New South Wales, the tar as received from the plant is stored into a large boiler shell and kept hot by means of steam coils. Mond gas tar, on account of its peculiar physical properties, holds a large amt. of water, a considerable part of which seps. out in this tank and is drawn off from the surface by means of a Dutch syphon. The tar is run from the bottom of the storage tank into a blower egg, from which it is elevated to the dehydrator. This is a round tank about 5.5 × 8 ft., fitted with steam coils, an overflow pipe leading back to the storage tank, and a run-off pipe directly connected with the tar still. Great care must be taken in dehydrating the tar, owing to its strong frothing tendencies. When the tar reaches 120° it is considered safe to charge into the still. The still is of regular design, 6 × 7.75 ft., with a concave bottom of 21 in. depression, and holds 1000 gal. Directly connected with it is a condenser, consisting of a vat containing a 2-in. iron-pipe worm, from which the oil, after condensing, runs into the storage tanks. The still is charged with about 900 gals. of dehydrated tar at about 130°. The tar is heated slowly to 190°, the heat being then increased for 6 or 7 hrs., the exact time depending on the sp. gr. of the oil at the worm end. When the sp. gr. reaches the desired point, the fire is drawn, and superheated steam is blown through the still for a further 2 hrs., it having been turned on soon after the distn. was under way. The steam not only assists mechanically in driving off the oil fumes, but



causes the oil to distil at a lower temp., and cools the pitch. By this time the fire is drawn the water in the condenser is almost up to the b. p. and the distillate is a thick, sticky, semi-solid oil of 1.12 sp. gr. After all the oil has been driven off, the residual pitch is run off at the bottom into coolers and allowed to set. It is later consumed in the gas producer with the coal, giving further quantities of tar, gas and  $\text{NH}_3$ .

J. L. WILEY.

Some applications of physical chemistry in the coal-tar industry. WILBERT J. HUFF. *J. Ind. Eng. Chem.* 10, 1016-19(1918).—The address deals with volume relations in solidifying creosotes and with vapor densities of coal-tar fractions.

J. H. YOUNG.

Cascade-boiler-plant for fractional distillation of coal tar in continuous operation. WERNER BERGS. *Chem. App.* 5, 81-3(1918).—The plant of the Zimmermann and Jansen, G. m. b. H. type in Düren (Rhld) is described and the operation explained. The working of this plant is very simple and economical. Sketches are included.

TH. VERHEGGEN.

Influence of temperature on the decomposition of sodium carbolates and cresylates by carbon dioxide. G. J. DENBIGH. *J. Soc. Chem. Ind.* 37, 306-77(1918).—The fractions of coal tar which contain the bulk of the tar acids are crude naphtha, light oil and carbolic oil, and the crude acids are extd. from these by washing with NaOH soln. The sepn. of the crude acids from the Na salts is effected most economically by decompn. with  $\text{CO}_2$ , thus regenerating  $\text{Na}_2\text{CO}_3$ , which is again causticized and used for the further treatment of fresh oils. In the working of crude carbolic plant, D. noted the apparently abnormal decompn. by the  $\text{CO}_2$ . This was made in a lime kiln and after purification contained 17-20% of  $\text{CO}_2$ . It was found that a small variation in the % had little or no effect on the rate of decompn., so attention was directed to the effect of temp. By bubbling gas through an ordinary cresylate soln. it was evident that decompn. was much more rapid at high temp. than at lower. More careful expts. were then arranged. Phenol with a solidifying point of 40.5°, *o*-cresol solidifying pt. 30°, *p*-cresol solidifying pt. 35.6°, and *m*-cresol were obtained, the purity of the latter being ascertained by Raschig's nitration test as 99.4%. In each case the calcd. amt. was dissolved in 800 cc. of 10% NaOH and the soln. dild. until titration with 0.1  $\text{N}$   $\text{H}_2\text{SO}_4$  showed the soln. to be exactly 2N, with phenolphthalein as indicator.  $\text{CO}_2$  from a Kipp app. was passed through a soln. of  $\text{NaHCO}_3$  and collected in a gas holder. Two and one-half l. were then slowly passed through 100 cc. of the sodium phenoxide soln. This represented an excess of gas. The phenoxide soln. was then shaken with 50 cc. of benzene, in 2 portions; after standing for an hour the benzene sepd. into a well-defined layer. The undecomposed phenoxide was removed and 20 cc. and 10 cc. of 10% NaOH were successively shaken with the benzene soln. to re-form sodium phenoxide. After setting, this was run off, heated to 80°, cooled, decomposed with 30 cc. of 25%  $\text{H}_2\text{SO}_4$ , and the liberated phenol was measured in a graduated cylinder. These expts. were repeated with the same quantities at different temps. and the results plotted. The vols. of  $\text{CO}_2$  were corrected for temp. and pressure, and the temp. of the phenoxide or cresylate soln. regulated by a thermostat. The chief difficulty found in the work was in sepg. the benzene soln., at least 1 hr. being required. The results established are: (1) All the cresols are more easily liberated than phenol. (2) Cresols differ only slightly, *m*-cresol being the most easily liberated, *o*-cresol the least. (3) In the case of both phenol and cresols the decompn. is more complete when warm, and the rate increases more rapidly with the cresols than with phenol. It is possible, to a certain extent, to sep. cresol from phenol by fractional decompn., but like fractional washing, which gives a carbolate containing some cresylate or a cresylate containing some phenoxide, it is by no means as complete as could be desired.

J. L. WILEY.

**Development of the coke industry in Colorado, Utah and New Mexico.** F. C. MILLER. *Bull. Am. Inst. Mining Eng.* 1918, 1693-5.—A discussion (cf. *C. A.* 12, 1920). Mr. C. H. Gibbs gives the history of the coke industry in Utah. The only genuine coking coal found in Utah is the Sunnyside coal. An av. analysis shows for coal and coke, resp.: moisture 1.2, volatile matter 39.13, fixed C 53.69, ash 5.98%; moisture 0.81, volatile 0.83, fixed C 87.36, ash 11, S 0.7-1, P 0.03-0.05%. J. L. W.

**Some economic considerations in coke-oven practice.** W. COLQUHOUN. *Gas World* 69, No. 1794 (Coking and By-products Sec.), 19-20, No. 1798, 21-3(1918). E. J. C.

**By-product coke oven and its products.** W. H. BLAUVELT. *Bull. Am. Inst. Mining Eng.* 1918, 597-614, 1677-8, 1770-1.—While the number of beehive ovens in the U. S. has been steadily decreasing, the number of by-product ovens has increased from 4624 in 1911 to about 7660 in 1917, with 2800 building, making a total of about 10,460 in operation in 1918. The total production of coke in 1917 was estd. at 56,600,000 tons, of which 60% was from beehive ovens and 40% from by-product ovens. (Abstractor's Note: On Nov. 2, 1918, by-product ovens assumed what would appear to be a permanent lead over beehive ovens by a production of 51% of the total.) The superiority of American by-product ovens over those of Europe, from the viewpoint of metallurgical practice, is due to the larger units and larger output per unit, the more extensive use of labor-saving machinery, and the use of silica refractory material which permits of higher heats and shorter coking time. The modern oven will carbonize more than 20 tons per day. In order to meet the requirements for a metallurgical fuel, it is agreed that the coke must be hard, must be resistant to attrition and oxidation, must have an open-cell structure, that is, cells of good size and approx. 50% of cell space, and must be highly combustible. The by-product oven, with its variable mixts. of coal, variable heats, coking time, width of oven, fineness of coal charged, and other controlling factors, not only permits such a control of coke but also allows the use of many coals which would not be suitable with the beehive oven. As the best coals are being progressively exhausted, this latter point becomes more important. In discussing the recovery of by-products, such as tar, benzene,  $\text{NH}_3$ , gas, etc., and their utilization, B. states that the surplus gas, above that used for heating the ovens themselves and the tar obtained in the production of a ton of coke, will furnish the necessary fuel to produce a ton of ingots from an open-hearth steel furnace or 10-15% more iron from a blast furnace than when heated with producer gas. Without considering the value of the other by-products recovered, this illustrates the importance of the by-product oven as a fuel supply to the steel industry. It is hard to suggest any other industry of comparatively recent introduction which does more to conserve the natural resources of our country. J. L. WILEY.

**New ovens at Lambton.** G. P. LISHMAN. *Gas World* 69, No. 1794 (Coking and By-products Sec.), 17(1918).—The 35 Simplex regenerative ovens recently installed are described. E. J. C.

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Combustion of an explosive gas mixture within a closed vessel (FLAMM, MACHE) 2.

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MONNETT, OSBORN: **Boiler Fuels and Furnaces.** Chicago, Ill.: Power Plant Engineering. 128 pp.

MONTGOLFIER, PIERRE DE: **La tourbe et son utilisation.** Paris: Dunod et Pinat. 173 pp. 7 fr. 50.

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**Fuel mixture.** W. JOITE. U. S. 1,285,208, Nov. 19. A fuel mixt. in block form

is made of clay 22, finely divided bituminous coal 25, coke dust 50 and hydrocarbon oil 3 parts.

**Destructive distillation.** A. L. PEARSE. Brit. 119,700, Oct. 11, 1917. Coal, shale, lignite, etc., are destructively distd. while passing through zones of different temps., and the different gaseous products are drawn off at different levels from the retorts through outlets which are arranged to overhang certain parts of the retorts in such a manner that obstruction of the outlets cannot take place. The heating of the retorts is effected by gas and regeneratively heated air, and the burners and flues are so arranged that the products of combustion pass downward through staggered passages arranged so as to be easily adjustable for varying the heating and for maintaining a uniform heat throughout each horizontal zone. The coke is cooled by the air which passes to the burners. Cool air may be admitted when desired to the flues, and steam may be introduced into the retorts to increase the production of  $\text{NH}_3$ . A suitable app. is specified.

**Gas manufacture.** T. McCLELLAND. Brit. 119,885, Sept. 24, 1917. Gas for engines and the like is formed by the passage of an elec. current between fine granules of C contained in an insulating vessel of porcelain or the like, the granules being moistened with  $\text{H}_2\text{O}$  or other liquid, *e. g.*, an acid or alk. soln. A suitable app. is specified.

**Lampblack from oil-gas refuse.** R. D. PIKE. U. S. 1,285,363, Nov. 19. The C from the carbonaceous refuse product obtained in oil-gas manuf. is recovered for use in the manuf. of C electrodes by washing out tarry and other impurities and then roasting the residue to remove volatile hydrocarbons and comminuting the purified solid residue.

**Retort-furnace for producing illuminating-gas.** P. G. STRASSMANN. U. S. 1,285,833, Nov. 26.

**Emulsions of tar-like substances.** O. LÜHRS. Dan. 23,419, Aug. 22, 1918. Tar is mixed with waste lye from alkali-cellulose manuf.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

The growth of a great industry. CARL F. SPEH. *Paint, Oil and Drug Review* 66, No. 25, 8-10; No. 26, 8-9(1918).—About the turpentine and rosin industry.

E. J. C.

Hicks, J. A.: *Laboratory Book of Mineral Oil Testing*. 3rd Ed. Revized. London: Charles Griffin & Co. 93 pp. 3s. 6d.

**Reducing viscosity of petroleum oils.** A. PHILIP. U. S. 1,286,091, Nov. 26. Petroleum oils which are so highly viscous that they cannot be readily pumped for use as fuel are mixed with 8% or less of  $\text{C}_{10}\text{H}_8$  to reduce their viscosity.

**Refining petroleum oils.** R. E. HUMPHREYS. U. S. 1,286,179, Nov. 26. After treatment of petroleum oil with concd.  $\text{H}_2\text{SO}_4$ , the acid sludge is drawn off, leaving a body of oil containing a small amt. of sulfonic acids in soln., the oil is neutralized with  $\text{NaOH}$ , and dil. alc. is employed thereafter to ext. the salts formed.

**Purifying oils.** A. E. DUNSTAN. Brit. 119,751, Nov. 28, 1917. Oils obtained by cracking are purified by slow distn. in the presence of a small proportion of an anhydrous chloride such as  $\text{AlCl}_3$ . The  $\text{AlCl}_3$  may be used in the form of a soln. in an anhydrous solvent such as abs. alc., or may be mixed with a dry inert material.

**Apparatus for cracking hydrocarbons.** E. W. ISOM. U. S. 1,285,200, Nov. 19.

**Apparatus for cracking hydrocarbon oils to produce a motor-fuel.** W. A. HALL. U. S. 1,285,136, Nov. 19. The app. is especially designed for carrying out the process described in U. S. pat. 1,175,910; C. A. 10, 1429.

### 23. CELLULOSE AND PAPER.

A. D. LITTLE.

**Guide to the bleaching of pulp and paper.** JAMES BEVERIDGE. *Paper* 23, No. 8, 11-5(1918).—A description of various types of pulp-bleaching equipment, together with a formula for calcg. the amt. of steam required for bleaching pulp of different densities.

R. B. ROE.

**Chlorinated lime vs. electrolytic bleach.** ANON. *Papier fabr.* 7(1918); *Paper* 23, No. 9, 11-4(1918).—An elaborate series of expts. showed that electrolytic bleach gives a better white than chloride of lime with a saving of 5% bleach. Increasing the alkalinity of bleaching soln. increases the bleaching effect, although the velocity of reaction is decreased. Slightly acidifying neutral or alk. bleach improves the results while strongly acidifying decreases the efficiency. No explanation is advanced for the better results obtained with electrolytic bleach.

R. B. ROE.

**Factors in the measurement of pulp fibers.** JOHN H. GRAFF AND MARIE HODGDON. *Paper* 23, No. 13, 11-5(1918).—The strength and quality of sulfite and sulfate pulps are intimately connected with the length of the fibers. The following procedure is suggested for detg. fiber length: At least 10-20 sq. in. of sample are disintegrated with H<sub>2</sub>O in an Erlenmeyer flask. A small portion is removed to another flask. dild. with H<sub>2</sub>O so that the ratio of fiber to H<sub>2</sub>O is 1:1000, and a small quantity of this soln. is transferred to a test-tube. Three other test-tubes are filled in the same way. With a wide-mouthed dropper a drop is removed and placed on a slide, the water is evapd., and the dry fibers are stained with I-KI soln. The excess stain is carefully removed with filter paper under the dissecting microscope, a drop of CaCl<sub>2</sub> soln. is added and the excess removed. The slide is placed under the dissecting microscope and 25 representative fibers "teased" to the center of the slide so that they lie side by side. The length of these fibers is then measured under a microscope fitted with a micrometer eyepiece. In the same way 2 drops are taken from each test-tube making a total of 200 measurements. The av. fiber length in mm. is detd. and the percentage of fiber lengths of 0-1 mm., 1-2 mm., 2-3 mm., 3-4 mm., and 4+ mm., recorded. The investigation shows that there is no distinct advantage in making over 200 measurements of one sample, and that one operator can prep. 3 samples, make the necessary 600 measurements and plot the results on a chart in 1 day.

R. B. ROE.

**Indirect cooking by forced circulation.** ALBERT E. NIELSEN. *Paper* 23, No. 10, 11-5(1918).—A comparison of the advantages and disadvantages of several well known methods of cooking wood pulp is given.

R. B. ROE.

**Beating tests.** E. SUTERMEISTER. *Paper* 23, No. 14, 11-3(1918).—Using the half-mill beating test, S. repeated the work of Mansfield and Stephenson (cf. C. A. 11, 887) and found that beating sulfite fiber in the presence of various chemicals produced but a very slight increase in strength compared to the results of M. and S., due probably to some unknown factor in the quality of the pulp. Comparative tests on soda and sulfite pulps which were treated with various agents and allowed to age for a definite period, showed that water treatment alone gave a strength increase with soda pulp. With sulfite pulp, soaking in bleach soln. and 2% HCl at first increased the strength but longer soaking showed a decided decrease. Treatment, followed by storage,

with 2%  $\text{CaCl}_2$ , 5%  $\text{NaCl}$ , 1%  $\text{ZnCl}_2$  and  $\text{H}_2\text{O}$ , all produced decided increases in strength. Samples of bleached soda and sulfite pulps which had aged for various periods after bleaching showed no consistent strength variation when sampled at different time intervals. Tests are given showing the importance of making up hand sheets of constant wt. Using the ordinary hand mold, the wt. of the hand sheet will decrease as the stock becomes more hydrated, and correcting for different hand sheet wts. by dividing the bursting strength figure by the wt. of the sheets does not give the same result as when the wt. of the sheets is maintained constant. Attention is directed to the great variation in the size and vol. of different ball mills supposedly of the same dimensions. It is possible this variation may cause the fiber to "knot," and it is necessary to det. by expt. the proper charges if two ball mills are used. R. B. ROE.

**Analysis of sulfite acid.** PETER KLASON. *Pulp and Paper Mag. Can.* 16, No. 46, 47(1918).—A critical study of the common methods for analysis of sulfite cooking acid shows these methods incorrect. A correct method for titration of the acid is proposed and a formula is given for calg. the results obtained. R. B. ROE.

**Rape straw as a paper and fodder material.** E. HEUSER AND T. BLASWEILER. *Papier-Ztg.* 43, 593; *J. Soc. Chem. Ind.* 37, 574A.—The compn. of the rape plant is somewhat similar to that of cereal straw. Analysis showed, on the dry substance, 30.31% cellulose, 24.1% pentosans, 40.06% lignin, and 5.53% ash. A pulp prepd. by the soda process had the compn.: cellulose 55.60%, pentosans 30.50%, lignin 10.10%, ash 3.77%. The pulp so obtained would be suitable for the manuf. of boards. R. B. ROE.

**Log bark (ANON) 29.** A new bleaching powder for use in hot climates (RETTIE, et al) 18. Emulsions of tar-like substances (Dan. pat. 23,419) 21.

**Lockwood's Directory of the Paper and Stationery Trades.** 44th Ann. Ed. Canada: Lockwood Trades Journal Co. \$5.00.

**Cellulose acetates.** H. DREYFUS. U. S. 1,286,172, Nov. 26. Cellulose acetates which are practically insol. in a mixt. of alc. and  $\text{C}_6\text{H}_6$  and also in  $\text{CHCl}_3$  but sol. in acetone of high concn. and also in a mixt. of alc. with  $\text{CHCl}_3$  (such as may, e. g., be made by the process described in Brit. pat. 20,977, 1911 (C. A. 7, 891), are treated with dil.  $\text{HNO}_3$  to render them sol. in a mixt. of alc. with  $\text{C}_6\text{H}_6$ .  $\text{HNO}_3$  of a strength of about 12% is preferably used, at ordinary temp., and the material is tested from time to time to det. its solubilities.

**Cellulose nitro-acetic esters.** J. KOETSCHET. U. S. 1,286,025, Nov. 26. A nitro-acetic deriv. of cellulose is formed by treating cellulose with glacial  $\text{HOAc}$  containing 1-20%  $\text{Ac}_2\text{O}$  together with  $\text{HNO}_3$  and a condensing agent such as  $\text{H}_2\text{SO}_4$ , acetylating the resulting fluid product with additional  $\text{Ac}_2\text{O}$  and then partially saponifying and pptg. the acetylated product. The product thus formed gives solns. of great viscosity.

## 24. EXPLOSIVES AND EXPLOSIONS.

CHARLES E. MUNROE.

**Explosives which are chemically possible.** ALFRED STETTBACHER. *Arch. sci. phys. nat.* 44, 380-1(1917).—Although nitroglycerin is one of the most violent of the explosives in use to-day, it is far from being an ideal explosive, since it develops but about 43% of the energy of combustion which could be set free by the direct oxidation

of its C and H contents. One kg. of nitroglycerin develops 1580 Cal. Better results are obtained by the direct combustion of a hydrocarbon with O as in oxyliquite, 1 kg. of which yields about 2,200 cal. Combinations of hydrocarbons with O in the ozone arrangement (peroxides) are among the most violent explosives known to chemistry.

Examples are ethylene ozonide,  $\begin{array}{c} \text{CH}_2 \\ | \\ \text{CH}_2 \end{array} \text{O}_3$ , and benzene triozone,  $\text{C}_6\text{H}_6(\text{O}_3)_3$ . Their

heats of combustion are not quite equal to that of oxyliquite, but the velocity of decomposition and brisant character of these pure compounds render them more violent, possibly the most violent in existence. By means of  $\text{HClO}_4$  still more powerful explosives can be obtained; glyceryl trichlorate develops 3000 Cal., which is but little less than double that of nitroglycerin. In this compound there is reached the best but also the last explosive compound possible, for there does not exist another compound which contains at the same time a larger quantity of O and a superior endothermic capacity. However, 1 kg. of a stoichiometric mixture of liquid H and liquid  $\text{O}_3$ , if it could exist, would develop 4500 Cal. But this does not mark the limit of our resources, for the energy change attendant on the disintegration of Ra surpasses the latter number 200,000 times. Chemistry may, by attaching the radioactive forces to elementary atoms, and by developing the electric arc under solar conditions of temperature and pressure, produce explosives of a fabulous character.

CHARLES E. MUNROE.

**Military explosives of to-day.** J. YOUNG. *J. Roy. Soc. Arts* 66, 706-15, 719-30, 733-42 (1918).—A popular exposition of methods of manufacture and of characteristics with descriptions of simple illustrative experiments. There have been no epoch-making discoveries in explosives such as, say, the discovery of nitroglycerin, for many years. None is likely to be made until someone discovers how to dissociate elements into their primitive constituents in the fraction of a second, in the same way that radium is dissociated in a million years or so.

CHARLES E. MUNROE.

**Purification of marine fiber by nitration.** B. J. SMART. *Chem. Eng. Min. Review, Australia* 10, 380 (1918).—Posidonia or marine fiber is obtained from Spencer's Gulf, S. Australia. It contains 16.1% mineral matter, of which over  $\frac{1}{4}$  can be removed by mechanical means. By boiling this shaken material with 3%  $\text{H}_2\text{SO}_4$  solution for 3 hrs. and washing, the ash content was reduced to 0.68%. On treating this last material, after thorough drying, with 3 pts.  $\text{H}_2\text{SO}_4$  (1.84) and 1 pt.  $\text{HNO}_3$  (1.5) a yield of 72% of a product containing 12.3% of N and no ash was obtained. It was not possible to obtain a heat test higher than  $170^\circ\text{F}$ . for 10.5 minutes, probably because of the degree of comminution which, as Robertson and Smart have shown, affects the Abel test. But by the Will  $135^\circ$  test 2.5 g. of the product gave 6.4 mg. of N per 4 hours, while Waltham Abbey gun cotton gives 6.0-6.5 mg. in the same period; it is believed that this fiber shows promise as a source of gun cotton.

CHARLES E. MUNROE.

**Nitration of posidonia fiber.** B. J. SMART AND P. PRECOVER. *J. Soc. Chem. Ind.* 37, 300-11 (1918).—This is an amplification of the paper of the preceding abstract.

CHARLES E. MUNROE.

**Detection of acidity in smokeless powder.** A. ANGELI. *Atti accad. Lincei* 27, I, 164-6 (1918); *J. Soc. Chem. Ind.* 37, 608A.—All the known methods of detecting the stability of smokeless powder exhibit disadvantages. A. proposes to replace them by the use of the indicator dimethylaminoazobenzene. This forms red salts, which become fixed to the surface of the explosive as a dyestuff does to a fiber. A few cc. of distilled water containing 3 or 4 drops of a 0.2% alcoholic solution of the indicator are poured on to about 0.5 g. of the powder, the whole being well stirred. Powder of good quality turns lemon-yellow, whereas, if more or less acidity is present, it becomes more or less intensely red; in either case, the supernatant liquid remains completely colorless. Not all

explosives which are acid show low stability when subjected to the heat test, but expt. demonstrates that they inflame far more readily than normal explosives when kept in large amt. at a relatively high temp., and they also burn irregularly and incompletely, and in the firing test exhibit abnormalities in the pressure and range. A dil. soln. of the above indicator may be used for revealing the effect of light on smokeless powder; the parts of the latter which have been exposed are turned red by the soln., whereas the other parts become yellow.

CHARLES E. MUNROE.

**Color reaction of mercury fulminate with phenylhydrazine.** A. LANGHANS. *Z. angew. Chem.* 31, I, 161-3(1918); *J. Soc. Chem. Ind.* 37, 637A.—When dry mercury fulminate, 0.2 to 0.3 g., is treated with 0.5 to 1 cc. of phenylhydrazine and allowed to stand, the powder becomes olive-green changing to gray, while the liquid becomes brown and then reddish brown. When dild., after a few hours, with  $C_2H_5OH$  and treated with dil.  $H_2SO_4$ , the liquid gives a fine reddish violet coloration. The reaction, which is very sensitive, takes place more rapidly on heating. It can be used for the detection of  $Hg(NOC)_2$  in the presence of  $KClO_3$ ,  $Sb_2S_3$ , glass, and adhesive substance as contained in detonator and percussion cap compns. The reaction is also produced by  $HCl$  or  $HNO_3$  though not so sharply. Alkalies change the color to yellow and give a ppt., while acids restore the original color. A soln. of  $Hg(NOC)_2$  in  $Na_2S_2O_3$  or in  $C_6H_4N$  also gives the reaction. If, prior to the reaction, the phenylhydrazine is treated with  $CH_3I$  an intense violet to bluish violet coloration of the character of methyl violet is obtained. The dyestuff can be extd. with  $CHCl_3$ ; its reactions indicate that it is parosaniline.

CHARLES E. MUNROE.

**New detonators made without fulminate of mercury.** ANON. *Prof. Notes U. S. N. Inst. Proc.* 44, 2625(1918).—The Germans produced a cap by inserting in the brass or copper capsule a strip of tin, the exposed face of which was varnished with lacquer in which red P and a small amount of diphenylamine had been incorporated, and then pressing in 30 mg. of a mixture of equal parts of  $KClO_3$  and  $Sb_2S_3$ . When struck the friction of the red P against the charge produces ignition. The device is alleged to possess the proper degree of sensitiveness, great ignition capacity and perfect keeping qualities.

CHARLES E. MUNROE.

**Safety of TNT as an explosive.** J. M. WEISS. *J. Ind. Eng. Chem.* 10, 1028 (1918).—TNT as manufd. may contain highly nitrated phenolic derivs. which form unstable salts with metals and accidental explosions of TNT may have been due to this cause. W. gives a citation from Nolting and Forels' investigation of the 6 isomeric xyliidenes (*Ber.* 18, 2668) in confirmation of his views.

CHARLES E. MUNROE.

**Graphic method for the fortification of the spent acids used in making nitrating mixed acids.** D. LOPEZ AND A. A. SWANSON. *Chem. Met. Eng.* 19, 816-21(1918).—Graphic charts used in the explosives factories are shown and the methods for their construction and use described.

CHARLES E. MUNROE.

**Some notes on the Halifax explosion.** HOWARD L. BRONSON. *Trans. Roy. Soc. Canada* (3) 12, 31-5.—See *C. A.* 12, 2689.

CHARLES E. MUNROE.

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Combustion of an explosive gas mixture within a closed vessel (FLAMM, MACHE) 2,

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**Separating nitro compounds from liquid.** F. M. G. JOHNSON. *Can.* 187,937, Dec. 17, 1918. The acids are confined at pressures below atm. until the particles of nitro compd. are floated to the surface by accumulation of gas on the particles. The cleared acid is drawn off from beneath the floating mass which is finally heated to melt the nitro compds. and cause complete sepn. from the remaining acid. Cf. *C. A.* 12, 2055.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

The problems of the dyestuff industry. F. W. TAUSSIG. *J. Ind. Eng. Chem.* 11, 55-7(1919).—An address. E. J. C.

The dyestuff tariff situation. F. W. TAUSSIG. *Color Trade J.* 4, 1-4(1919); *Textile Colorist* 40, 373-6(1918). E. J. C.

The dyestuff situation in the United States. WILLIAM J. MATHESON. *Textile Colorist* 40, 369-71(1918). E. J. C.

The future of the American dye industry. W. H. NICHOLS. *J. Ind. Eng. Chem.* 11, 53-5(1919).—An address. E. J. C.

The British dye industry. *J. Soc. Chem. Ind.* 37, 429-30R(1918).—A memorandum to the president of the British Board of Trade setting forth the views of the Executive Council of the Assoc. of Brit. Chem. Manufacturers on the present situation in that section of chem. industry directly concerned with the production of dyes. E. J. C.

State assistance to the dye industry. *J. Soc. Chem. Ind.* 37, 428-9R(1918).—A memorandum by the British Board of Trade on the scheme for the allocation and administration of the funds provided by parliament for the development of the dye industry by means of financial assistance to companies to aid in developments, extensions and research. E. J. C.

Indigo industry in Swatow district. ANON. *J. Roy. Soc. Arts* 67, 21(1918). E. J. C.

The absorption of sulfuric acid by wool with some notes on the theory of dyeing. W. HARRISON. *J. Soc. Dyers Colourists* 34, 57-8(1918).—The author and others observed (*Trans. Faraday Soc.*, Apr., 1910) that the positive elec. charge acquired by wool after boiling with dil.  $H_2SO_4$  soln. changed to negative when boiling water was passed through the wool, showing that the acid had been removed. The acid function of wool (corresponding to a negative charge) appears therefore to be predominant. Lloyd (*C. A.* 7, 4074) pointed out that after wool was boiled in acid the acid absorbed was partly removed by boiling water although a considerable portion was retained. Fort and Lloyd (*C. A.* 8, 3370) came to the conclusion that some acid was permanently retained after repeated extns. In order to ascertain whether or not the conclusion arrived at by Gee and the author was correct a series of expts. has been made. Five g. of wool were boiled in 300 cc. of water containing  $H_2SO_4$  (4.9% on the wt. of wool) for 1 hr. After cooling, the wool was well rinsed and packed lightly in a glass tube. The acid unabsorbed was titrated and the wool extd. with boiling water. 24 extns. were made, each being titrated separately. The results are recorded as a curve. In the expts. of Fort and Lloyd 2% of acid remained after 12 extns., whereas in the present expt. only 1% remained after 4 extns., 0.2% after 14; after 24 extns. practically all the acid was removed and the wool had no more affinity for acid colors than untreated wool. In accordance with the known facts relating to phenomena of this kind there should be conditions of concn. and temp. where the amt. of  $H_2SO_4$  passing into soln. should bear a mol. relationship with the amt. of dyestuff or other salt absorbed, and H. cites an instance of a ppt. being formed when starch is treated with  $Ba(OH)_2$ . The author concludes that the dyeing of wool with acid dyestuffs is a colloid-chem. problem and not an ordinary chem. reaction. L. A. OLNEY.

The theory of the acid dye bath for wool. M. FORT. *J. Soc. Dyers Colourists* 34, 124-6.—Harrison (cf. preceding abstract) describes a method by which  $H_2SO_4$  may be completely removed from wool with which it has been boiled. This is contrary to



the findings of previous investigators. F. regrets that there was no definite assurance as to the purity of the water used for extn. The amt. of acid remaining would only be equal to 1.5 parts in 100,000, based upon the quantity of water used by H. in his extn., hence the necessity for assurance of complete absence of temporary hardness and alkalinity. It is usual in the titration of water exts. of wool to find the presence of albuminoid matter which may cause an opalescence as neutrality is approached and slightly affects the figures in the direction of over-titration. F. believes that a large amt. of evidence relating to the equil. in dyeing and stripping and the chem. properties of fiber and dye must be dealt with before the chemical theory of dyeing wool in an acid bath can be abandoned in favor of a theory based upon remote causes of attraction in other fields. The present elec. theory of dyeing appears to include within its scope both contact-elec. phenomena and electrochem. ionic transferences without sufficient differentiation. The comparison made by H. between the combination of  $\text{H}_2\text{SO}_4$  with wool and colloidal pptn. of starch by  $\text{Ba}(\text{OH})_2$  does not enable one to understand how wool is able to affect the decompn. of  $(\text{NH}_4)_2\text{SO}_4$  and that wool can be dyed with acid dyes in a dye bath containing  $(\text{NH}_4)_2\text{SO}_4$  without the dye bath necessarily becoming acid throughout the whole operations. F. points out other conclusions of H. which he believes difficult to reconcile with previous results and believes that the adoption of the elec. theory in regard to the acid dye bath at present would obscure more than it can reveal.

L. A. OLNEY.

**The theory of the acid dye bath for wool.** W. HARRISON. *J. Soc. Dyers Colourists* 34, 127-8(1918).—Communication in reply to M. Fort's criticism (cf. preceding abstract) of H.'s paper (cf. second abstract above) states that all obvious precautions were taken to avoid error. Had the water been alk. the results by titration would obviously have been lower and would have indicated less acid removed. Various authorities are mentioned in support of H.'s views and in conclusion he states that the elec. theory is in no way opposed to the chem. theory.

L. A. OLNEY.

**Discussion on the theory of dyeing.** W. HARRISON, *et al.* *J. Soc. Dyers Colourists* 34, 96-9(1918).—The chem. theory of dyeing assumes that wool and silk form a chem. compd. together with the dyestuff. In the case of basic dyes the basic portion enters directly into combination with the fiber while the acid portion is left in the bath. In the case of acid dyes Knecht found that dyestuffs of the same homologous series were absorbed by wool in proportion to their mol. wts., but this did not hold for dyestuffs of different series. More recently Fort (*C. A.* 9, 2711) showed that under certain definite conditions the amt. of  $\text{H}_2\text{SO}_4$  left free in the bath over and above that left when no dye was used corresponded in wt. to the amt. of dye absorbed. He also found (*C. A.* 9, 2710) this relationship did not hold during other conditions of concentration. H. has recently pointed out (*Ibid* 34, 5) that these exceptions are met with in several cases of adsorption. The mechanical theory was based on the fact that substances of an indifferent nature such as glass beads, porcelain and quartz, could be dyed in a similar manner to fibers only to a less extent. Georgievics held that most cases of dyeing were in agreement with Henry's law in regard to the distribution of a substance between two solvents. The surface tension or adsorption theory is a modification of the mechanical calcns. of Gibbs, who showed that substances which diminish the surface tension of water at the surface of contact with air or with another liquid become concd. at that surface. In the elec. theory 4 factors are taken into account: (1) the mol. movement of dyestuffs in soln. which gives rise to osmotic pressure phenomena, rise in b. p., lowering of the f. p., Brownian motion, etc.; (2) the elec. charge on the dye and on the fiber; (3) the surface of the fiber including that within its pores; and (4) the size of the dye particles. The mol. movement of dye particles or ions enables them to get into contact with the fiber, the movement being accelerated or retarded as the elec. charges

upon the dye and fibers are of the opposite or same sign, resp. The dye particles or ions may be held on the fiber by elec. attraction when dye and fiber carry opposite charges, or by other means when the charges are of the same sign, as is the case with direct colors on cotton. In this case the dye is coagulated on or in the fiber, because its elec. charge is neutralized by the oppositely charged ions of water mols. immediately in contact with the fiber.

L. A. OLNEY.

**Theories of dyeing.** J. I. CRAVEN. *J. Soc. Dyers Colourists* 34, 128(1918).—Over 50 years ago Crum proposed the following theory which has not been improved upon to any extent: Dyes whether substantive or adjective do not combine chemically with the fiber but are imbibed into cavities and pores by what is termed capillary attraction which has the power of decomposing certain substances and retaining them within cells or cavities.

L. A. OLNEY.

**Properties of airplane fabrics.** E. DEAN WALEN. Washington. *J. Am. Soc. Mech. Eng.* 40, 933-7(1918).—A subtitle reads "Methods used by the Bureau of Standards in developing a cotton fabric as a substitute for linen for airplane wing coverings." Previous difficulties encountered in expts. on cotton fabrics were four: low strength per unit wt.; low tearing resistance; little shrinkage upon the application of dope; little tendency to retain that slight shrinkage after doping. The method of covering airplane wings is described, also the methods for detg. the properties of undoped fabrics. The points detd. were moisture, wt., length of yarn, crimp, yarn count, thread count, twist of the yarns, tensibility properties, tearing resistance, resistance to uniformly distributed pressure, and bursting-tear. Several special pieces of app. for making some of the above tests are described with illustrations. Similar tests were made on doped fabrics. Dope films were made by painting the dope on glass plates and the films were subsequently peeled off and tested for tensile strength and resistance to pressure. The results of the tests are shown in five diagrams of curves with full descriptions. When properly made, a cotton fabric is capable of resisting more pressure than linen and will have practically the same tautness. The maintenance of the strength and tautness of cotton fabrics is dependent upon the completeness with the dope protects the fabric and the completeness with which the dope is protected from deteriorating influences such as light and weather. Further expts. are being conducted.

L. W. RIGGS.

**English methods for finishing sateens.** A. FIELD. *Dyer, Calico Printer; Color Trade J.* 3, 395-9(1918).—Minute details are given of the practice as followed in English factories. Twelve formulas are quoted giving the compn. of finishing mixts. to produce various results in the appearance of the fabric.

L. W. RIGGS.

**Sections of artificial silk.** H. DE CHARDONNET. *Compt. rend.* 167, 489-91(1918).—The transverse section of a thread of raw silk shows a crescent form on account of the gum covering the two filaments which make the thread. Each of these filaments in cross section presents the form of a triangle with the angles rounded. Artificial silk is made by projecting a liquid into water or into air, where it instantly coagulates and is followed in the latter case by the evapn. of the solvent. The projection into air furnishes fibers of greater solidity and transparency. Silk made by pptn. in water is usually circular in cross section which upon evapn. of the solvent becomes deeply scalloped, while that made in air gives a cross section more or less elongated with rounded ends. The nature of the fibers is modified by the concn. of the pyroxyline in the alc. ether solvent.

L. W. RIGGS.

**Corn starch in the textile industry.** W. R. CATHCART. *Text. Colorist* 40, 339-42(1918).—This paper is largely a criticism of statements made by C. C. Moore in a pamphlet entitled "The use of starch in the textile industry, with special reference to the value of potato starch for sizing and finishing." The principal advantages claimed

for Corn starch are low cost and uniformity of action under the conditions of its use in textile industries. It changes its viscosity but slightly on boiling while potato starch loses more than two-thirds of its viscosity by boiling 30 min. (cf. MacNider, *C. A.* 7, 550, 1421). Since corn starch is manufactured continuously throughout the year in large factories under scientific supervision, a product having any property desired by the textile manufacturers may be uniformly produced. L. W. RIGGS.

The possibility of cultivating fiber plants in Australia. T. HOGG. Commonwealth of Australia, Advisory Council of Science and Industry, *Bull.* 7, 126-34 (1918). E. J. C.

A new bleaching powder for use in hot climates (RETTIE, *et al.*) 18.

Dyes. SOC. CHIMIQUE DES USINES DU RHONE, ANCIENNEMENT GILLIARD, P. MONNET ET CARTIER. *Brit.* 119,860, Aug. 21, 1918. Bromoindigos and homologs thereof are obtained by brominating indigo or its homologs or their lower halogen derivs. in chlorosulfonic acid in the presence of a dehydrating agent having greater affinity for  $H_2O$  than has  $SO_3$ ;  $P_2O_5$  is specified. Examples are given for the production of tetrabromoindigo and tri-, tetra-, penta-, and hexabromo-*o*-tolyindigo.

Vat dye from 1-aminoanthraquinone-2-aldehyde and hydrazine. G. KALISCHER. U. S. 1,285,727, Nov. 26. A monoazo dye is obtained by condensing an azomethine compd. derived from 1-aminoanthraquinone-2-aldehyde (or the latter compd. itself) with hydrazine. The dye is a dark red powder, very difficultly sol. in org. solvents of high b. p., sol. in concd.  $H_2SO_4$  with an olive color which on the addition of paraformaldehyde is changed into an intense greenish blue color and yields a blackish violet vat with hyposulfite and NaOH, which dyes cotton claret-red shades of good fastness.

1-Aminoanthraquinone-2-aldehyde. G. KALISCHER. U. S. 1,285,726, Nov. 26. 1-Aminoanthraquinone-2-aldehyde, crystals with a metallic luster, m. about  $233^\circ$ , dissolving in concd.  $H_2SO_4$  with a brown color which on addition of paraformaldehyde is changed to blue, and yielding with hyposulfite and NaOH a bright green vat, is made by treating with acids the condensation products formed by heating 1-amino-2-methylantraquinone with aromatic nitro compds. such as  $PhNO_2$ , with the addition of  $PhNH_2$  or other primary aromatic amine and in the presence of alkalies.

Wool-like pattern effects on cotton. O. KLAUSER. U. S. 1,285,738, Nov. 26. Wool-like pattern effects on cotton are produced by printing with a resist and treating the fabric, thus prepd., with  $H_2SO_4$  of a strength of less than  $50.5^\circ$  Bé. at a temp. of about  $-4^\circ$  or lower and then washing out the acid and resist. Cf. *C. A.* 12, 1422.

Dyeing. V. PLANTÈ. *Brit.* 119,881, Aug. 17, 1917. Piece goods or garments of wool, silk, or velvet, are dyed by means of basic dyes dissolved in  $CCl_4$  (with or without alc.) with the aid of a mordant containing  $NH_4$  gallate and oleate, prepd. from a mixt. in specified proportions of triolein gallic acid, alc., and aq.  $NH_3$ . The process is assisted by passing an elec. current through the dye bath; for this purpose the goods are placed in an Fe wire basket immersed in dye liquid in an Fe vat provided with leads. After being dyed the materials are extd. with benzine and rinsed.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Polymerization of linseed-oil and wood-oil. W. FAHRION. *Chem. Umschau* *Pette, Oele, Wachse u. Harze* 24, 102-4, 117, 144-5 (1917); 25, 14-5, 27-8, 39-40, 51-2, 63-4, 74-7, 87-8 (1918).—A critical review. TH. VERHEGGEN.

Thymolphthalein as an indicator in the acidimetry and alkalimetry of dark solutions (HOLDE) 7.

**Pigments.** E. F. MORRIS and T. N. C. NEVILL. Brit. 119,713, Oct. 17, 1917. A white pigment consisting of a mixt. of Sb oxide and  $\text{BaSO}_4$  is produced by treating  $\text{Sb}_2(\text{SO}_4)_3$ , or the product obtained by treating  $\text{Sb}_2\text{O}_3$  with  $\text{H}_2\text{SO}_4$  with  $\text{BaCO}_3$ .

**Antimony oxide.** E. F. MORRIS and T. N. C. NEVILL. Brit. 119,711, Oct. 17, 1917. Sb oxide for use as a pigment is rendered free from acid substances by heating it in  $\text{H}_2\text{O}$  with a substance which neutralizes acids, such as  $\text{Na}_2\text{CO}_3$ , borax, pptd. chalk, or a mixt. of these. As an example, a thin mixt. of Sb oxide and  $\text{H}_2\text{O}$  is treated with milk of lime and  $\text{H}_3\text{BO}_3$  in such proportions as to leave the resulting soln. alk. to litmus but not sufficiently alk. to give a ppt. of chalk on breathing into it. The quantity of lime required is about 0.5% of the quantity of Sb oxide.

**Antimony oxide.** E. F. MORRIS and T. N. C. NEVILL. Brit. 119,712, Oct. 17, 1917. Sb oxide for use as a pigment is purified from compds. of an acid nature by treating it, preferably while suspended in air in a comparatively dry state, with a substance which neutralizes acid.  $\text{NH}_3$ , an org. amine, or an atomized alk. substance such as Ca borate may be employed.

**Paint for wood.** T. SUZUKI. Jap. 31,422, Aug. 22, 1917. A wood paint is prepd. by mixing alizarin black, red, and violet,  $\text{K}_2\text{Cr}_2\text{O}_7$ , glacial  $\text{HOAc}$ , and gum arabic. E. g., alizarin black 2.34, alizarin violet 1.75, alizarin red 0.59,  $\text{K}_2\text{Cr}_2\text{O}_7$  15.99, glacial  $\text{HOAc}$  20.00, and gum arabic 14.00.

## 27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Report of the committee on the analysis of commercial fats and oils. W. D. RICHARDSON, *et al.* *J. Ind. Eng. Chem.* 11, 69-71 (1919).—The committee's rept. is accompanied by "Corrections to tentative standard methods for the sampling and analysis of commercial fats and oils to Sept. 4, 1918," and by a statement, with notes, of the "Methods of analysis adopted September 4, 1918." E. J. C.

The occurrence of azelaic acid as a product of the spontaneous oxidation of fats. BEN H. NICOLET and LEONARD M. LIDDLE. *J. Ind. Eng. Chem.* 8, 416-7 (1916).—This paper has been previously overlooked through an error. E. J. C.

The treatment of oats to obtain oil. HUGO DUBOVITZ. *Chem. Ztg.* 42, 13-4 (1918).—3250 kg. of shelled oats, with an oil content of 7.17%, were extd. There were obtained 129 kg. of 96.32% oil and 343 kg. emulsion (with an oil content of 14.3%). After the treatment the oats still contained 1.54% of oil. The oil after purification with  $\text{H}_2\text{SO}_4$ , had the following compn.: water 3.68%, ash 0.08%, unsaponifiable matter 1.61%, acid value 62.11, sapon. value 180.13, iodine value 91.73,  $n_{\text{D}}^{20}$  1.4706, glycerol content 7.50%,  $d_{4}^{20}$  0.9110. TH. VERHEGGEN.

Soap industry in Argentina. JOSÉ M. FERREIRO. *Anales soc. quim. Argentina* 6, 52-6 (1918).—F. gives typical analyses of the following 4 classes of soaps mfd. in Argentina: (1) yellow, (2) perfumed, (3) medicinal, (4) antiseptic. The content of fatty acids in these 4 classes showed the following resp. variations: (1) 17.97-36.35%, (2) 53.36-78.91%, (3) 60.30-74.30%, (4) 1.30-21.22%. The resp. contents of resins varied as follows: (1) 17.49-25.87%, (2) 10.12-11.09%, (4) 3.42-16.70%. The common yellow soaps were largely adulterated with inorganic material, the av. content being 19.7% (principally  $\text{CaCO}_3$  and  $\text{Na}_2\text{CO}_3$ ). The contents of  $\text{H}_3\text{BO}_3$ ,  $\text{Na}_2\text{B}_4\text{O}_7$ , glycerol and  $\text{HgCl}_2$  present in various samples of medicinal soaps were detd. The tech-

nic of the soap industry in Argentina has not been highly developed; complete sapon. of fats is only practised in the case of the finest soaps. F. suggests the following measures for improving the status of the industry: (1) installation of factories for "splitting" fats with production of products such as glycerol, stearin, etc.; (2) stimulation of the culture of oil-producing plants which are of value to the industry; (3) establishment of an electrolytic NaOH industry; (4) passage of laws and adoption of regulations for controlling the quality of common soaps; (5) establishment of adequate chem. control in the factories to guarantee the quality of the raw material employed and the efficiency of the technic of manuf.

H. S. PAINE.

**Hydrogenating fatty substances.** C. ELLIS. U. S. 1,285,959, Nov. 26. The material to be hydrogenated, *e. g.*, crude oleic acid, is mixed with colloidal Ni or other catalyst and atomized in a current of H, hydrogenated product is sepd. and unhydrogenated material is returned to the hydrogenating app. for a repetition of the treatment. U. S. 1,285,960, specifies the use in hydrogenation, of colloidal catalytic material such as Ni, Co, Cu or Fe, together with H, which is free from O and Cl. Exclusion of the latter substances avoids deterioration of the catalyst.

**Soap mixture.** J. W. BODMAN. U. S. 1,285,004, Nov. 19. A mixt. of thick, pasty consistency is formed of soap mixed with H<sub>2</sub>O and with about 30% its weight of alc. and about 3 times as much of a hydrocarbon solvent such as naphtha, some of the latter being liberated upon the addition of H<sub>2</sub>O to the mixt. at the time of use. The mixt. is especially adapted for removing grease and oil. CCl<sub>4</sub> may be used instead of naphtha.

**Washing compound.** A. IMHAUSEN. Dan. 23,346, Aug. 5, 1918. A washing compd. is composed of soap, benzine or benzene, and an oxidizing agent such as NaBO<sub>2</sub>, with NH<sub>4</sub>Cl to prevent explosion. Cf. C. A. 12, 1602.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

**Beet sugar industry in the United States.** C. O. TOWNSEND. U. S. Dept. Agr., *Bull.* 721, pp. 56(1918).—A list of beet-sugar mills of the U. S. is given showing their location and capacity, together with a discussion of the factors influencing the growth, cultivation, harvesting, etc., of sugar beets.

J. J. SKINNER.

**The Australian sugar industry.** HARRY T. EASTERBY. Commonwealth of Australia, Advisory Council of Science and Industry, *Bull.* 7, 135-52(1918). E. J. C.

BLAKE, A. F.: *Nomon*. Sugar Technologists' Edition. Urbana, Ill.: The Nomon Sales Agency. \$1.50. For review see *J. Ind. Chem. Eng.* 11, 86(1918).

CHAUDHURI, TARINI C.: *Modern Chemistry and Chemical Industry of Starch and Cellulose*. Calcutta: Butterworth & Co. 156 pp. 3-12.

**Apparatus for extracting sugar juices from plant materials.** L. NAUDET. U. S. 1,286,066, Nov. 26.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

**Theories of the different modes of tannage.** LOUIS MEUNIER. *Chimie & industrie* 1, 71-80, 272-6(1918).—See C. A. 12, 2706.

E. J. C.

**Log bark.** ANON. *J. Am. Leather Chem. Assoc.* 13, 595-6(1918).—The Forest Products Lab., U. S. Dept. of Agr., has completed expts. on a com. scale which indicate that hemlock bark, free from wood, obtained in paper mill operations, can be successfully used as a source of tannin. E. J. C.

**Ceanothus velutinus (snow brush) as a source of wax and tannin.** CHAS. C. SCALIONE AND HERBERT S. BLAKEMORE. *J. Ind. Eng. Chem.* 8, 411-3(1916).—This paper has been previously overlooked through an error. E. J. C.

**Extracting glue from chrome-tanned leather.** F. J. TURNER. U. S. 1,285,474, Nov. 19. Chrome-tanned leather or leather scrap (after soaking) is placed in a soln. containing 0.75 oz. NaOH for each lb. of leather used and boiled to ext. the glue, and the soln. is sepd. and evapd. to the desired viscosity.

**Tanning hides.** K. HARING. U. S. 1,285,144, Nov. 19. Hides are dehydrated by treatment with alc. or other suitable liquid having an affinity for H<sub>2</sub>O, subjected to reduced pressure and then treated with asphaltum and subjected to super-atmospheric pressure.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

**Venezuelan production of balata.** ANON. *J. Roy. Soc. Arts* 67, 46-7(1918). E. J. C.

DITMAR, R.: **Mischungsbuch für die Kautschuk-, Guttapercha-, Balata-, Kabel-, Isolier- und Factis-industrie.** Wien und Leipzig: W. Braumüller. 170 pp. f. 2.10.

**Apparatus for testing the expansion of rubber and other plastic materials.** W. JAMESON. U. S. 1,282,085, Oct. 22.

**Colored vulcanized rubber compositions.** J. M. WEISS. U. S. 1,282,505, Oct. 22. Vulcanized compns. of light color are formed by incorporating with the rubber mixt., prior to vulcanization, a light-colored semi-solid or solid bitumen such as may be obtained by the destructive distn. of coal-tar pitch, and then subjecting the mixt. to vulcanization.

**Composition for soles of foot-wear.** G. R. WYMAN and A. E. CURRIER. U. S. 1,284,023, Nov. 5. A compn. for shoe-soles or heels is formed of a mixt. of comminuted waste felt roofing, satd. and treated with asphaltum and boiled linseed oil, reclaimed rubber, PbO, S and ZnO, all vulcanized together.

**Mixing rubber with pulverulent materials.** W. C. KNOWLTON and H. A. HOFFMAN. U. S. 1,286,024, Nov. 26. Pulverulent substances such as lampblack, to be compounded with rubber, are formed into granular lumps with a binder such as starch paste and these lumps are then incorporated in dry condition with rubber on a heated mixing mill. The formation of the pulverulent material into lumps, as a preliminary step, serves to prevent spreading of dust in the atm. during the mixing.

**Reworking rubber from old tires.** F. L. HARLEY. U. S. 1,285,992, Nov. 26. The method relates chiefly to comminution and other mechanical treatment of the material.

**Impregnating or coating textile fabrics with balata.** L. A. FRANCOIS. U. S. 1,285,105, Nov. 19. A soft, pasty mass of balata is passed between heated rolls and then applied to fabric to be coated, on both sides of the fabric simultaneously, and the

coated fabric is then successively passed between calendering rolls and around a cooled and moistened roll.

**Rubber substitute.** E. R. TALLEY. U. S. 1,285,463, Nov. 19. A mixt. for use as a rubber substitute is formed of vegetable oils, coal tar or asphalt, camphor, powdered shale and S, vulcanized together. Asbestos and white lead also may be used.

**Substitutes for rubber, etc.** F. J. BENNETT and F. W. MELLOWES. Brit. 119,878, Oct. 10, 1917. Substitutes for rubber, vulcanite, etc., are made by mixing together a fatty oil, S, or compd. of S, and stearin, or other hard fat, with or without other ingredients and then heating them. In some cases, the heating is performed in a vessel capable of resisting heat and pressure. The fatty oils employed may be linseed oil or castor oil; they may be replaced in part (from 5 to 40%) by a mineral oil such as petroleum oil. In one example, the following ingredient and proportions are employed: linseed oil 1, S 1, stearin 1,  $\text{Fe}_2\text{O}_3$  0.5. A small proportion of tar, or resin or other pitch-like substances may be added. Also lime may be added. The material may be strengthened by adding sawdust, cellulose in the form of cotton, jute, and paper. The material is sol. in most of the well known rubber solvents and then forms a varnish.

**Rubber.** GENERAL RUBBER CO. Brit. 116,324, June 1, 1917. A process of drying coagulated or uncoagulated latex comprizes insolubilizing the nitrogenous matter and then submitting the mass to vacuum evapn. The insolubilization may be accomplished by the action of heat or by the action of agents such as antiseptics, polycyclic org. compds., hydroxynaphthalenes (particularly  $\beta$ -naphthol), and enzymes. Suitable app. is specified.

**Rubber.** GENERAL RUBBER CO. Brit. 116,326, June 1, 1917. Rubber latex is treated with a polycarbocyclic member of the benzene series or with a hydroxy deriv. thereof in order to conserve therein the nitrogenous and other constituents of the latex and to prevent the formation of slime. *E. g.*, the latex may be treated with 0.2% of  $\beta$ -naphthol before or after the addition of S, and the product may in addition be given a surface treatment with an alc. soln. of  $\beta$ -naphthol.

**Rubber, etc.** GENERAL RUBBER CO. Brit. 116,323, June 1, 1917. Coagulated rubber, gutta, chicle, and like latex is treated, *e. g.*, with mono- or polyhydroxymono- or polycyclic benzenoids or their ethers, esters, salts, polymers, or other compds. of them, such as gallic acid, tannins, cresols, naphthols, diaminophenol, *p*-aminophenol,  $\beta$ -naphthol, etc., in order to form in the coagulum an insol. layer which prevents the passage therethrough of colloidal nitrogenous matter, etc., and so prevents the formation of slime on the coagulum. *E. g.*, freshly coagulated rubber is immersed in a 5% soln. of  $\beta$ -naphthol in alc. for 30-40 seconds and then allowed to dry, the membrane which is formed being permeable to  $\text{H}_2\text{O}$ . The reagent may also be dusted, sprayed, or painted on, or applied as a paste. S or other vulcanizing agent may be incorporated prior or subsequent to the treatment.

**Rubber, etc.** GENERAL RUBBER CO. Brit. 116,322, June 1, 1917. Unvulcanized rubber or similar vulcanizable material is subjected to the action of a vacuum for removal of the fluids normally contained within such materials, the vacuum being subsequently broken by the introduction of an inert gas or liquid. Examples of suitable inert substances are  $\text{CO}_2$ ,  $\text{NH}_3$ , H, and N. Cf. 10,695, 1913 (*C. A.* 8, 3507), and 17,193, 1914 (*C. A.* 10, 296).

**Plastic compositions.** NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE-MAATSCHAPPIJ TOT EXPLOITATIE VAN OPTIMIET FABRIEKEN. Brit. 118,270, June 13, 1918. In the manuf. of substitutes for ebonite derived from rubber and for the phenol-formaldehyde condensation products, waste or new rubber is dissolved in a drying oil (or an oil, such as rapeseed oil, which can be vulcanized) with which have been mixed by

heat, paraffin, wax, stearin, or similar substance and also resin or resinous material. The pulp thus made is intimately incorporated with finely divided filling material in quantity to yield a thin film of the oil on each particle of filler. S or other vulcanizing material is mixed with the filler. Suitable fillers are chalk, barytes, infusorial earth, and clay. The plastic mass is pressed or molded and vulcanized by steam.

**Vulcanizing rubber.** C. E. ANDREWS. U. S. 1,280,940, Oct. 8. Aminocymene or one of its salts is used in vulcanizing rubber with S, to shorten the time required for vulcanization. The proportion of aminocymene added may be 0.5-5%.

**Vulcanizing rubber, etc.** MORGAN & WRIGHT. Brit. 118,305, Aug. 9, 1917. The extent of expansion during vulcanization is taken as indicative of the degree of vulcanization attained. The invention consists in heating the rubber, etc., previously mixed with a vulcanizing agent, and discontinuing the supply of heat when the rubber has expanded to an extent indicative of the degree of vulcanization desired. A series of expansions during the time of application of heat may be detd. with a sample of rubber compd. confined in a cylinder provided with a piston and gage for indicating expansion and with a steam jacket. A table prepd. from these observations can be used as a guide in mfg. vulcanized articles.



# CHEMICAL ABSTRACTS

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## I. APPARATUS.

L. C. JONES.

**Gas bubbler for gas analysis.** O. D. BURKE. *Chem. News* 117, 368-9(1918).—A narrow, glass tube is drawn out at one end into a very fine capillary, which is ground level at the point or end. Another glass tube is fused on to the straight tube (as a side tube), and extends downwards to just beneath the capillary, where it is flattened out and the top surface ground. The capillary is made to fit tightly on the flat ground surface of the second tube. The upper end of the straight tube passes through a 2-hole stopper which is inserted in a bottle or flask containing the absorbent, and connected to an aspirator. Gas passing through the capillary tube is broken up into very fine bubbles, no rushing can take place, and the time interval for the passage of a certain vol. of gas is identical in all cases. F. W. SMITHER.

**The determination of the specific gravity of liquids.** K. NORTON. *Gas World* 69, 284(1918).—The author recommends the use of a plummet, giving instructions for making same in the lab., and describing its calibration and use. F. W. SMITHER.

**Automatic variation of gas pressure and its application to a vacuum pump, circulation of gases, magnetic stirrer.** O. MAASS. *J. Am. Chem. Soc.* 41, 53-9(1919).—A control is described for making a Töpler mercury pump automatic. Description is given of an app. which enables a definite quantity of gas to be withdrawn from or circulated through the same app. A magnetic stirrer is described. ERLE M. BILLINGS.

**An instrument for recording sea-water salinity.** A. L. THURAS. *J. Wash. Acad. Sci.* 8, 676-87(1918).—The instrument previously described (cf. *C. A.* 12, 1353, 1714, 1846) has been tested and exptl. data have been obtained. The app. and method are described in detail with illustrations. The various sources of error have been investigated; they were mostly found to be negligible. The accuracy of the method is limited by the accuracy with which the standard sea-water in the sealed cell is known. The sp. cond. at 25° of sea-water throughout the range of concn. found in the open ocean was found to be 0.04518 to 0.05767 reciprocal ohms; salinity, 29.15 to 38.46;  $d_{20}$ , 1.01896 to 1.02598. The mean temp. coeff. of sea-water per degree between 18° and 25° expressed in terms of cond. at 18° is 0.02237 for a salinity of 29, and 0.02212 for a salinity of 37. The paper concludes with suggested applications of the salinity recorder in conjunction with other recent recorders for making physical oceanographic measurements. F. W. SMITHER.

**The plexsim electric still.** ANON. *Electrician* 81, 724(1918), 2 illus.—A brief description of a small elec. still intended primarily as a convenient means of providing distd. water in labs. C. G. F.

**Checking calibration of thermocouples and pyrometers.** ANON. *Elec. Rev.* 74, 56-9(1919).—A detailed illus. account of sources of error, methods of calibrating, maintenance of standards and app. required. C. G. F.

**Acetylene generator.** C. LAY. U. S. 1,286,665, Dec. 3.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

**The methods of chemistry.** H. J. PRINS. *Chem. Weekblad* 15, 1381-8(1918).—A philosophical discussion. It is maintained that "facts" are as perishable as "theories," in that they are dependent on the accuracy and reliability of our observations. Future refinements in methods and instruments may change or revise the facts of today.

JULIAN F. SMITH.

**Technics and science.** G. DE CLERCQ. *Chem. Weekblad* 15, 1530-45(1918).

E. H.

**Filtration in the laboratory.** ROBERT T. SMITH. *Color Trade J.* 4, 21-4(1919).—Discussion of natural filtration without pressure, filtration by suction, and filtration under a hydraulic head, and of methods for washing ppts.

L. A. OLNEY.

**Scientific research in India.** ANON. *Engineering* 106, 606-8(1918).—A review and discussion based on: (1) Proceedings of a conference for the consideration of the organization of chem. research in India, held at Lahore, Jan. 8, 1918; (2) Indian Munitions Board handbook; (3) Annual Report of Indian Board of Scientific Advice, 1916-17.

F. W. SMITHER.

**The specific heat of platinum at high temperatures.** WALTER P. WHITE. Geophysical Lab., Washington. *Phys. Rev.* 12, 436-51(1918).—The specific heat of very pure, drawn, and carefully annealed Pt is given probably to within 2 per mille from 0° to 1300° by the formula  $0.03169 + 0.000064 \theta$ , in excellent agreement with what appears to be the best work of others, namely Magnus, 500-900°, and Gaede, to near 100°. The method was to drop a charge of about 160 g. from elec. furnaces into a water-filled calorimeter. From the results obtained it follows that the atomic heat at const. volume is 6.44 at 500°, 6.68 at 900°, 6.85 at 1300°.

W. P. WHITE.

**Specific heat of tungsten at incandescent temperatures.** PAUL FREDERICK GAHR. Cornell Univ. *Phys. Rev.* 12, 396-423(1918); cf. *C. A.* 12, 1432.—The sp. heat of a W filament is detd. from 1400 to 2600°. An elec. method is used, in which the elec. input, when the current is changed, equals the radiation plus the heat required to raise the temp. Unless special precautions are taken, the pyrometric detn. of instantaneous temps. is impracticable. The results when the temp. is rising are slightly different from those when it is falling. The exptl. difficulties are very great.

F. C. HOYT.

**Evaporation of small spheres.** IRVING LANGMUIR. *Phys. Rev.* 12, 368-70(1918).—Morse (*C. A.* 4, 1831) has detd. the rate of evapn. from small spheres of I in still air, and finds it proportional to the radius of the sphere and not to its surface. L. applies to this the theory already successfully applied to the convection of heat from small wires (*C. A.* 7, 1322). This assumes that the heat loss by "convection" consists essentially of conduction through a thin film of relatively stationary gas. The theory leads to the equation  $-dm/dt = 4\pi a D M p / RT$ , where  $m$  is the mass of the sphere,  $a$  the radius,  $D$  the diffusion coeff. for I,  $M$  the mol. wt.,  $T$  the temp. and  $R$  the gas const. The value of  $D$  calcd. from this equation and Morse's data is 0.053. No other data are available for this const., but the value seems reasonable compared to substances of similar mol. wt.

F. C. HOYT.

**Internal tension and complex molecules.** G. N. ANTONOFF. London. *Phil. Mag.* 36, 377-97(1918).—A theory of mol. attraction is based on the modern conceptions of atoms and mols. From this point of view the phenomena of mol. attraction depend on the same forces as chem. affinity. A relation between surface tension and mol. pressure has been mathematically deduced. Theoretically it is deduced that interfacial tension must be equal to the difference of the surface tensions against air of

both the superposed liquid layers, which agrees with expt. Two superposed layers in equilibrium are to be regarded as solns. in the same solvent; they must contain an equal number of mols. per unit vol. (Avogadro's law), as a result of the formation of complex mols. in the soln. The so-called monovariant systems may be obtained without fulfillment of the requirements of the phase rule if the mols. of the component added combine with those in soln. without increasing their number. S. C. LIND.

The spontaneous transformation to a colloidal state of solutions of odorous substances exposed to ultraviolet light. H. ZWAARDEMAKER AND F. HOGEWIND. *Proc. Acad. Sci. Amsterdam* 21, 131-7(1918).—Various solns. of odorous substances in water, glycerol, and paraffin were rapidly mixed and allowed to stand for several weeks. The following solns., arranged according to their degree of transformation, yielded a Tyndall effect: eugenol, cresol, guaiacol, citrol, cumidine, thymol and hyprion in water; eugenol, saffrol, creosote, nitrobenzene, cresol, and apiol in glycerol; and aniline, eugenol and cumidine in paraffin. Other solns. also gave a distinct effect. In general, the odorous substances which become intensely colloidal have a greater mol. wt. than those which are not transformed. The former generally bring about a lowering of the surface tension of water. On standing, the no. of submicrons appear to increase to the detriment of the amicrons. The surface tension and the odor of the solns. before and after transformation are approx. the same. The authors, therefore, term the transformed substances suspensoids. When exposed to an elec. current the particles appear to be negatively charged. When an aq. soln. of eugenol (1:1200) is heated beyond 40° the opalescence decreases and returns on cooling, becoming more intense after a few days. There is less opalescence on hot days than on cool days. The transformation process is more rapid in the sunlight than in the dark and still more rapid in ultraviolet light. Radium kept *in vitro* is effective in producing a colloidal state. The authors state that it is not likely that chemical energy comes into play but that there must be still another source of energy, as a eugenol soln. kept in a leaden casket becomes suspensoidal after a few days. F. POWDERMAKER.

The adsorption of arsenious acid by ferric hydroxide. M. C. BOSWELL AND J. V. DICKSON. *J. Am. Chem. Soc.* 40, 1793-1801(1918).—The curves of the adsorption of arsenious acid and of NaOH by Fe(OH)<sub>3</sub> in the presence of and absence of NaOH and of arsenious acid, respectively, have been constructed. The adsorption of arsenious acid is diminished by the presence of NaOH and the adsorption of NaOH is increased by the presence of arsenious acid. These measurements show a deviation from the simple adsorption equation  $E = \beta A^p$  where  $E$  is the concn. of the adsorbed material on the ppt.,  $A$  is the concn. of the adsorbed material in soln. and  $\beta$  and  $p$  are constants. If this simple equation held then the plot of the equation  $\log E = p \log A + B$  of all curves of a given adsorbent prepd. under varying conditions or of various ages would be a straight line with  $\beta$ , the intercept on the Y axis the only variable, and this would be Mecklenburg's "affine Adsorptionskurven." The logarithmic curves actually plotted show a concavity to the X axis. It would seem that the phenomenon of adsorption by gels from aqueous solns. has not the simplicity implied in the equation  $E = \beta A^p$ . What the theoretical significance of this deviation may be is not apparent. The exponent  $p$  remains const. for different preps. of Fe(OH)<sub>3</sub> where arsenious acid alone is used, but changes when alkali is present. H. I. MATTILL.

Colloidal silver. A. PICKLES. *Chem. News* 117, 358(1918).—On recovering Ag from residues the AgCl was converted to Ag<sub>2</sub>O in the usual way and thoroughly washed. To show its reducing power HCOH (60%) was used for the ultimate reduction, the operation being carried out in a vessel with a mech. stirrer. At 14° reduction was slow; at 35° reduction was accelerated, but the liquid acquired a pale lilac tint, increasing in intensity as reduction proceeded. This soln. passed unchanged through

ordinary filter papers, and has been preserved since June, 1917, the color becoming a rich ruby-red. No similar result could be obtained with acetaldehyde. Further expts. dispensing with continuous stirring and elevation of temp. gave no result in several cases, and in others only after several days, the color produced being only slight. The color was slowly discharged by salt solns.;  $\text{HNO}_3$  was most effective, especially on warming;  $\text{H}_2\text{O}_2$  (4 vol.) was slowly decomposed on slightly warming.

F. W. SMITHER.

**Inversion of cane sugar by colloidal silica.** ALBERT AND ALEXANDRE MARY. *Compt. rend.* 167, 644-6(1918).—Colloidal  $\text{SiO}_2$  was prepd. from  $\text{Na}_2\text{SiO}_3$  and  $\text{HCl}$ , and when dialyzed to 8% was very active in inverting cane sugar at temps. of 15 to 20°. Its catalytic power decreased after 5 to 6 hrs. The same hydrosol reduced to 5% by the addition of water retained its activity for 130 hrs. With a 1.5% hydrosol the activity was constant for four months. The duration of the period of activity is measured by the dispersive phase of the sols which are less stable as they are more concd. Non-dialyzed  $\text{SiO}_2$  hydrosols remain in a condition of physical instability comparable to that of cellular colloids, and rapidly coagulate. They slowly invert cane sugar and in general their action appears to be erratic. The addition of a slight excess of  $\text{Na}_2\text{SiO}_3$  to the non-dialyzed  $\text{SiO}_2$  gives a more stable product which also has a greater catalytic power.

L. W. RIGGS.

**Isomorphous mixtures.** PAUL GAUBERT. *Compt. rend.* 167, 491-4(1918).—Color phenomena are studied in mixts. of  $\text{KClO}_4$  and of  $\text{NH}_4\text{ClO}_4$  with  $\text{KMnO}_4$ , and in mixts. of chromates, sulfates and selenates of K, Cs, and Rb with  $\text{K}_2\text{MnO}_4$ . Optical indexes in relation to opacity of crystals were studied in mixts. of salts of Tl, Ag, and Pb with corresponding salts of K, Na, and Ba. Stability relations were observed in mixts. containing salts of Ag or  $\text{K}_2\text{MnO}_4$ . Crystals of chromates and selenates of K, Cs and Rb formed in a soln. containing  $\text{K}_2\text{MnO}_4$  are colored green, the intensity of color and therefore the amt. of manganate in the crystal being proportional to the concn. of the manganate in soln. at least up to 5%. The colored crystals are stable, homogeneous, transparent and almost without pleochroism since the pure crystals of chromates and of selenates are but slightly birefringent. These crystals behave like those of phthalic acid, meconic acid, nitrate and oxalate of urea when colored by methylene blue (cf. C. A. 1, 1676; 4, 732; 7, 579), but without modification of the habit; they are conveniently designated as A. When the soln. is sufficiently concd. to deposit crystals of  $\text{K}_2\text{MnO}_4$ , the crystals of A continue to increase in size, but the new layers consist of a mechanical mixt. of very small crystals of the A and of  $\text{K}_2\text{MnO}_4$ , the two kinds having the same orientation, but on account of the opacity of the new deposits, the growth cannot be followed. The structure of the exterior zones is therefore quite different from those of the center and is designated as B. In the case of the sulfates of K, Cs and Rb crystg. in a soln. of  $\text{K}_2\text{MnO}_4$  the first crystals deposited are nearly pure, although the soln. may be concd. with manganate; therefore no crystals of A are deposited. After a few min., when the solution in consequence of its alteration takes on a slightly violet tint, the crystals of the sulfates become colored, but their coloration differs entirely from that of the crystals of chromates and selenates; they are blue-violet with strong pleochroism, not at all agreeing with their birefringence. The flattened pseudo-hexagonal crystals show sectors unequally colored, corresponding to simple crystals and related to B. If the soln. is sufficiently concd. in manganate to allow the formation of crystals of that salt and of the sulfate, two forms of crystals are produced with the same orientation, small in size and sometimes invisible with the microscope. They are related to B, are unstable, following the mode of alteration of the manganate, while crystals of the type A keep indefinitely. Perchlorates of K and  $\text{NH}_4$  crystallizing with  $\text{KMnO}_4$  yield crystals of type A, as long as the soln. is not satd. with permanganate,

but if this satn. occurs there are formed mixed crystals of type *B*, composed of very small crystals of perchlorate satd. with permanganate and of permanganate satd. with perchlorate. These facts explain the form of a curve representing the compn. of the crystals as a function of the compn. of the soln.

L. W. RIGGS.

**Liquid crystals.** ANON. *Engineering* 106, 349-50(1918).—A review.

F. C. HOYT.

**Repression of dissociation.** R. N. DE HAAS. Wageningen. *Chem. Weekblad* 15, 1352-5(1918).—The statement is sometimes found in text-books that in the equation  $K = bc/a$  (where  $K$  is a const.,  $a$  the concn. of undissociated mols., and  $b$  and  $c$  are concns. of the dissociation products), if the factor  $c$  is increased  $b$  must decrease, thus repressing the dissociation. But this is not strictly correct; in the case of addition of one of the dissociated ions, variations in  $a$  must be taken into account. This observation is also true of the degree of ionization. Some text-books state that with  $a$  mols. of a binary electrolyte per unit vol., of which  $x$  mols. are dissociated, addition of an electrolyte yielding  $p$  mols. of a common ion changes the equation for the equil. from  $a - x = Kx^2$  to  $a - x = Kx(x + p)$ . But this neglects the fact that the ionization of the added electrolyte is also repressed, making  $p$  smaller. From mathematical considerations it is shown that the correct equation is  $(K - Kx - x^2)(K - Kx) = K'(x^2 + x^2 + Kx^2 - Kx)$ . H. takes occasion here to revize his definition of complex ions (*C. A.* 11, 3153). The revized definition is: An inorganic complex ion is one which contains a metal and is formed of 1 or more ions from 1 or more mols.

JULIAN F. SMITH.

**Xanthic acids and the kinetics of their decomposition.** H. VON HALBAN AND W. HEGHT. *Z. Elektrochem.* 24, 65-82(1918); *J. Chem. Soc.* 114, II, 222-3.—The rates of decompn. of xanthic acid  $(CS(OEt)SH)(a)$  and of  $CS(OMe)SH(b)$  in water at  $0^\circ$  have been studied. The soly. at  $0^\circ$  of these substances was first found to be: (a), 0.02 mol. per l.; (b), 0.05 mol. per l. The rate of decompn. was detd. by dissolving a known amt. of the Na salt of the acid in question in water, and when the soln. had reached  $0^\circ$ , liberating the acid with a slight excess of HCl, then after a measured interval of time neutralizing with a cooled soln. of  $NaHCO_3$ , and titrating with a 0.02 *N* I soln. It is shown that contrary to the behavior of solns. in org. solvents, the velocity const. in the present case, when calcd. on the basis of a unimolecular reaction, decrease rapidly with decreasing concn. The decompn. is positively catalyzed by H ions. This leads to the assumption that both the undissociated mols. and the ions take part in the reaction. On the basis of this assumption, the dissociation const. of the acids were calcd., and found to be independent of the diln., a fact which confirms the assumption. At  $0^\circ$  the dissociation const. for (b) is 0.034 and that for (a) 0.030. The addition of sulfates (Na, Mg, and  $NH_4$ ) to the decomposing xanthic acids in water soln. strongly retards the action; e. g., 0.25 *N*  $MgSO_4$  reduces the velocity of decompn. to  $1/3$  of the original value, and 3 *N*  $(NH_4)_2SO_4$  reduces it to  $1/4$ . A few velocity measurements have been made in ethyl, methyl, propyl, amyl, and benzyl alc. solns. to complete the data published in an earlier paper (*C. A.* 7, 3876). Measurements were made at  $0^\circ$  on the partition of (a) between water and  $CS_2$ ,  $CHCl_3$ ,  $C_6H_5NO_3$ , light petroleum, benzyl alc., and amyl alc., respectively. The dependence of the partition coeff. on the diln. is in accord with the dissociation const. calcd. from the velocity values. The absorption spectrum of solns. of xanthic acid in light petroleum, 0.5 *N* ethyl alcohol in light petroleum, and in diethyl ether was measured. Although the rate of decompn. is very different in the different solvents, no difference could be observed in the absorption curves.  $CS(OCH_2Ph)SH$  was prepd. from the K salt. It m.  $29^\circ$ ; when quite pure it can be kept for several hrs. In non-hydroxy solvents it has a normal mol. wt. The soly. and rate of decompn. have been detd. in 12 solvents. The satd. soln. at  $0^\circ$  has

the following concn. in these solvents: hexane 0.224 *N*, light petroleum 0.316 *N*, methyl alc. 0.36 *N*, acetic acid 0.41 *N*, nitromethane 1.49 *N*, acetonitrile 3.26 *N*, CS<sub>2</sub> 3.70 *N*, acetone 3.4 *N*, ether 2.93 *N*, benzene 3.33 *N*, ethyl bromide 3.88 *N*, and nitrobenzene 3.15 *N*. The van't Hoff velocity const. was calcd. from the data, and these values as well as those for (a) show that the catalytic influence of the solvent is not removed by the van't Hoff calcn.

D. MACRAE.

**Thermal dissociation of sulfur dioxide.** J. B. FERGUSON. *J. Am. Chem. Soc.* 41, 69-72(1918).—From the equil. const. for the reduction of SO<sub>2</sub> by CO and that for the dissociation of CO<sub>2</sub>, F. calcs. the thermal dissociation of SO<sub>2</sub> from 1000 to 1500°, and from 1 to 0.001 atm. It is found to be somewhat less than that of either H<sub>2</sub>O or CO<sub>2</sub>.

F. C. HOYT.

**Studies in conductivity. IV. The conductivity of alkaline earth formates in anhydrous formic acid.** H. I. SCHLESINGER AND R. D. MULLINIX. *J. Am. Chem. Soc.* 41, 72-5(1919); cf. *C. A.* 6, 566; 8, 3259; 10, 718.—Tables and graphs are given relative to the cond. of Ca and Sr formates in anhydrous formic acid.

ERLE M. BILLINGS.

**The calculation of the position of minimum conductivity in neutralization.** W. D. TREADWELL. *Helvetica Chim. Acta* 1, 97-110(1918).—A mathematical paper dealing with the neutralization and cond. of strong acids and strong bases, of mixts. of univalent strong and weak acids with a univalent base. The minima of cond., which result from the neutralization of dil. aq. solns. of strong and weak acids and their mixts. with alkalis, are calcd. The usual mathematical assumptions were necessary concerning the degree of dissociation of the electrolyte in question. The work with weak acids is found to agree with the observations of Duboux. The calcs. relating to medium strong acids are found to agree with the experimental work of Thiel and Roemer. Tables are given.

ERLE M. BILLINGS.

**Relation between certain galvanomagnetic phenomena.** C. W. HEAPS. *Rice Inst. Phys. Rev.* 12, 340-50(1918).—H. shows on the basis of the electron theory of metallic conduction that the Hall coeff. divided by the specific resistance of the metal is equal to the Corbino const. A simple exptl. method is described for detg. all three effects in the same specimen. In Zn and Cu the Corbino const. is probably independent of the magnetic field. In Bi the three effects are found to behave in the usual manner, but in cryst. graphite the resistance increases rapidly with the magnetic field, the Corbino const. decreases, and the Hall const. increases. From the usual theoretical interpretation, H. concludes that the number of free electrons per unit volume, and the free period of the electron are affected by a magnetic field.

F. C. HOYT.

**Reversal of the Corbino effect in iron.** ALPHEUS W. SMITH. *Ohio State Univ. Phys. Rev.* 12, 337-9(1918).—Chapman (*Phil. Mag.* 32, 303(1916)) has shown the reversal of the Corbino effect in iron at low magnetic fields. S. attempts to find a reversal of the Hall effect in Fe under these small magnetic fields. The reversal is not found, and the Hall and Corbino effects are proportional only throughout a certain range of magnetic field. Hence there is a fundamental difference between the Hall and Corbino effects.

F. C. HOYT.

**The angle of contact made with glass by a mercury surface which is covered with another liquid (abstract).** A. L. CLARK. *Can. Chem. J.* 2, 195.—When pure Hg is in contact with clean glass and covered by air, the angle of contact is large. If the Hg be covered by pure water, the angle is about 4°. When the water is replaced by a dil. H<sub>2</sub>SO<sub>4</sub> soln. the angle becomes 0. The paper is an account of measurements of the angle of contact with acid of various concns. and the conclusions derived from the expts.

E. H.

**Gases and vapors from glass.** R. G. SHERWOOD. Westinghouse Res. Lab. *Phys. Rev.* 12, 448-58(1918).—S. studies the emission of gases and vapors from Corning G-702-P glass in the high vacuum obtained by a Hg diffusion pump. The change of pressure, as measured with a Kundsen vacuum gage, with time serves to give the rate of evolution of the emanations, and integration of the curve gives the total gas emitted. The results indicate that there are two kinds of evolution products, the one resulting from adsorbed products, the other from chem. decompn. of the glass. There is a slow leakage of occluded gases at room temp. Heating at as low as 200° seems to be as effective in removing absorbed gases as at higher temps. The thickness of the adsorbed layer is of the order of magnitude of one mol.

F. C. HOYT.

**Limit and composition of the earth's atmosphere. Aurora borealis, meteors, and shooting stars.** A. VERRONNET. *Compt. rend.* 167, 636-8(1918).—For a fluid mass of density  $\rho$ , temp.  $T$ , under a force of gravity  $\gamma$ , the increase of pressure  $dp = -\gamma dm = -\gamma \rho dr = -\rho dr(\gamma \mu + RT)$ , the last term showing that the relative increase of pressure is proportional to the mol. wt. of the gas  $\mu$ . The results of the application of this formula to the gases of the atmosphere are given in tables and a diagram of curves showing the density and percentages of N, O, A, and H at varying heights from the earth's surface to 300 km. A mean temp. of -60° was assumed, also the presence of an infinitesimal amt. of H at the surface. The percentage of H increases steadily up to 150 km. where it is 11.1; at 200 km., 99.4; at 300 km. it is the only gas present and its extreme height is placed at 500 km., where its pressure equals  $15.10^{-14}$ . O falls to 10% at 50 km., 1.0 at 150, and 0.01 at 190. The percentage of N increases regularly up to 100 km. Between 100 and 150 km., it forms 96% of the air at a pressure less than  $10^{-8}$  atm., which is that of Crooke's tube. This is the region of Aurora borealis, characterized by the green N ray, and placed at 150 km. Beyond 150 km. the N rapidly falls, at 190 it is 2.4%, and at 200 km. 0.6%.

L. W. RIGGS.

**Amphoteric colloids (LOEB) 11A. Photolysis and electrolysis (BAUR) 3. A neon arc lamp for direct current (SCHROETER) 4.**

AULD, S. J. M.: **Gas and Flame in Modern Warfare.** Geo. H. Doran Co. 201 pp. \$1.35. For review see *Gas Age* 43, 61(1919).

PÉREZ, A.: **Comparación de los métodos matemáticos de los profesores W. Sorkau y A. Pérez para el establecimiento de las fórmulas con que se expresan las reacciones químicas.** Buenos Aires: Coni. 82 pp. For review see *Anales soc. españ. fis. quim.* 16, 719(1918).

SMITH, EDGAR F.: **James Woodhouse, a Pioneer in Chemistry.** Philadelphia: The John C. Winston Co. 299 pp. \$1.50. For review see *J. Phys. Chem.* 22, 656.

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

**Atomic structure from the physico-chemical standpoint.** ALFRED W. STEWART. Univ. Glasgow. *Phil. Mag.* 36, 326-36(1918).—After enumerating the actual radioactive and chem. phenomena that must be taken into account in devising a theoretical atom, S. proposes a structure built up of three sets of orbits, the innermost a small circular orbit of negative electrons, the second a somewhat larger circular orbit of positive electrons, and the outermost a cometary or elliptical orbit of electrons (negative), in which path a high degree of ellipticity will take the electrons at a certain part of their

course relatively very far from the two inner or nuclear orbits. S. then presents evidence favoring the proposed structure. Beta ray changes and their accompanying change of valence originate in the innermost circle, are very fundamental in character and irreversible. Alpha ray changes are brought about by the collision of two systems each containing two positive and one negative electrons, thus avoiding the assumption of the existence of helium atoms in the nucleus. Alpha changes are also fundamental and irreversible. Reversible changes of chem. valence are produced in the outer or cometary orbit. Elements showing different chem. valencies probably possess a high degree of ellipticity of orbit and are most subject to outside influences when the electrons are farthest from the nucleus. The fact of valencies differing often by two is explained by a short life of the intermediate valence state, which is illustrated in the intermediate radioactive products where two successive beta ray changes take place, the intermediate product being always very short lived in comparison with the other two. The term "isobare" is proposed for elements of the same at. wt. but different chem. character.

S. C. LIND.

**Atomic number and frequency differences in spectral series.** HERBERT BELL. Univ. Mich. *Phil. Mag.* 36, 337-47(1918).—B. has numerically tested the law that the square root of the doublet and triplet differences (of wave length) for elements of the same column of the periodic system is proportional to the at. weights. B., however, substitutes at. number for at. wt. By plotting the square root of the difference ( $\sqrt{\sigma}$ ) against at. number ( $N$ ), very satisfactory linearity was obtained in a number of the periodic columns. A similar relationship was found by Kayser and Runge's frequency intervals in the nitrogen column. A frequency difference of  $41.8 \text{ cm}^{-1}$  in the phosphorus series also seemed to fit. Linearity is also indicated for the He column. Runge and Precht's logarithmic law is not an improvement. In two columns of the periodic table a two-fold linearity was found, the lines branching at the element at which the branching of the periodic columns begins.

S. C. LIND.

**The electron theory of metallic conductors applied to electromagnetic distribution problems.** L. SILBERSTEIN. London. *Phil. Mag.* 36, 413-20(1918).—The electron theory of metallic conductors has been treated exclusively from the standpoint of current conduction and allied phenomena. The present is a mathematical application of the theory to electrostatic distribution in metals.

S. C. LIND.

**Bohr's hypothesis of stationary states of motion and the radiation from an accelerated electron.** G. A. SCHORR. Univ. Coll. of Wales, Aberystwyth. *Phil. Mag.* 36, 243-51(1918).—A mathematical discussion of Bohr's hypothesis *A* regarding the so-called stationary states of motion, from which it is concluded: (1) that the hypothesis is incompatible with the electromagnetic equations of Maxwell and Hertz taken together with the Poynting energy flux for the free ether, at least for the case of uniform circular motion of the electron, and almost certainly for any other form of motion of translation. (2) Hypothesis *A* can be made compatible by a restatement postulating no change in the electromagnetic energy of the electron in spite of the emission of radiant energy. For neither the accelerating energy nor the electromagnetic energy of an expanding electron is available as a source of the radiant energy.

S. C. L.

**A new secondary radiation of positive rays.** M. WOLFFKE. Zurich. *Phil. Mag.* 36, 270(1918).—A note of correction to the effect that the claim of (*C. A.* 12, 563), a new secondary penetrating radiation which was believed to be the characteristic radiation of tin and lead, was due to exptl. error, and that it has now been found to be due to excitation by positive ions.

S. C. LIND.

**The scattering of light by air molecules.** R. W. WOOD. Johns Hopkins Univ. *Phil. Mag.* 36, 272-3(1918).—W. suspects that the recent results of Strutt (*C. A.* 12, 2488)



on the scattering of light by air molecules may have been influenced by the effect of ultraviolet light in producing a cloud. This is a source of error which W. encountered with a similar apparatus which forced him to abandon the expts. He now suggests repetition, using air vaporized from liquid air to avoid use of a drying agent which he believed to be connected with the cloud formation.

S. C. LIND.

A comparative study of the flame and furnace spectra of iron. G. A. HEMSALECH. Univ. of Manchester. *Phil. Mag.* 36, 209-31 (1918).—A comparison of the Fe lines in an electric carbon tube resistance furnace with those obtained by the introduction of Fe salts into gas flames with the object of ascertaining whether the lines are of purely thermal or of chemical origin. It is concluded that up to nearly 2400° the spectra are produced by the action of heat on a chem. compd. of Fe not on the metal itself. Fe lines have been observed as low as 1500°. The lines emitted by Fe compds. in flames are identical with those obtained in the furnace at corresponding temps. up to 2400°; hence it is concluded that the mode of excitation is the same in both cases, namely, chem. dissociation of an Fe compd. by the action of heat. The character of the spectrum is independent of the nature of the compd.; chlorides, oxides, etc., give the same spectra in both sources of heat at the same temp. The name *thermochemical excitation* is used to designate this cause of emission. These spectra differ entirely from those given by the same compds. in the explosive region of the air-coal gas flame, where the emission is due to chemical excitation at comparatively low temp.

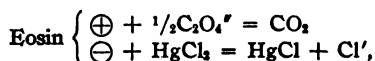
S. C. LIND.

The origin of the line spectrum emitted by iron vapor in an electric tube resistance furnace at temperatures above 2500°. G. A. HEMSALECH. Univ. Manchester. *Phil. Mag.* 36, 281-97 (1918); cf. preceding abstr.—The results of the present expts. have led to the conclusion that the so-called high-temp. spectrum of Fe, which is emitted above the temp. of the boiling metal, is not caused by purely thermal action, but requires the joint action of electric forces. The furnace spectrum of Fe at 2700° is entirely different from its flame spectrum at the same temp. The behavior of certain groups of lines indicates that the high-temp. spectrum of Fe approaches in character that of its arc spectrum. It is exptly. shown that an ionization current will pass through the Fe vapor in a tube furnace. As in the elec. spark, the line emission of Fe vapor in the furnace does not stop abruptly on the removal of the field. The spectrum emitted after the current is broken is not controlled by the temp. of the furnace; a certain group of lines at 4957 is visible at 2300° which under ordinary circumstances cannot be observed at 2400°. Cu, Ag, and Zn vapors do not give line emission at 2700° in the elec. tube furnace, probably because their vapors possess a low degree of elec. cond. as compared with Fe, Co and Ni. This view is supported by observation of the spark spectrum of the same metals. Attempts to excite a line spectrum in Fe vapor by thermal action alone led to negative results. The following classification of excitation of light radiations has been made by H: (1) Thermal action alone. No line or band spectrum has been observed in this class for Fe vapor. (2) Thermo-chem. excitation. Action of heat on chem. compds. without dissociating them. Observed in the mantles of all flames so far examined and in the elec. tube furnace to nearly 2500°. (3) Chemical excitation, involving the complete decomposition at relatively low temp. of an Fe compd. and the formation of a new one owing to the strong chem. affinity between Fe and N. This is met with in the explosion region of the air-coal gas flame and gives rise to a highly developed spectrum. (4) Thermo-elec. excitation accompanies elec. discharge through Fe vapor already highly ionized by heat action. The ordinary elec. arc between Fe poles is a special case where the degree of ionization is maintained by the application of high voltage. (5) Elec. excitation occurs in the capacity and self-induction sparks between Fe electrodes at ordinary temp.

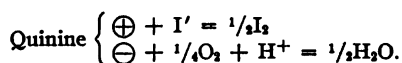
S. C. LIND.

**Some properties of the active deposit of radium.** S. RATNER. Univ. Manchester. *Phil. Mag.* 36, 397-405(1918).—R. has investigated the spread of active material across a small air space from an activated plate to a receiving disk. The phenomenon has hitherto been known only as source of error in recoil and other radioactive measurements. Very puzzling phenomena were encountered by R., the elucidation of which was not accomplished. The spread of Ra A, for example, was found to be proportional to the quantity of Ra Em producing the Ra A, in exposures of the same length, but not proportional to the quantity of Ra A as a function of the time of exposure. Very short exposures led to the spread of almost as much Ra A to the opposite disk as much longer exposures. The washing and heating of the plate previous to the collection of Ra A was found to play an important but unexplained role. A very definite half period for the spread of Ra A was found, having the value 1.4 min. This suggested unknown intermediate products, which other evidence, however, disproved. Owing to the influence of the electric wind, a field much enhanced the spread of active material, but the direction of the field was immaterial, and a strong air current between plate and disk prevented any spread taking place. In many expts. a high field was employed in the direction to withhold the recoil atoms from the receiving disk. The chem. or phys. nature of the plate surface had no influence. Although not leading to an explanation of the phenomena, valuable information was gained, showing that the quantity of material spread is so great as to vitiate all previous results on the deposit of beta ray recoil atoms. It was also established that the proportion of recoil atoms of Ra B carrying a negative charge is certainly less than 1 to 100,000. S. C. LIND.

**Photolysis and electrolysis.** EMIL BAUR. Federal Tech. H. S., Zürich. *Helvetica Chimica Acta* 1, 186-201(1918).—Insolated uranyl salt solns. act as if they contained both a higher and a lower state of oxidation, i. e., in reacting with oxalic acid they are able both to oxidize to  $\text{CO}_2$  and to reduce to CO;  $5 \text{U}^6 + \text{light} = 3\text{U}^5 + 2\text{U}^4$ , which reacts as follows:  $\text{U}^5 + \text{C}_2\text{O}_4'' = \text{CO}_2 + \text{U}^6$ ; and  $\text{U}^4 + \text{C}_2\text{O}_4'' = \text{CO} + \text{U}^6$ . Insolated uranyl salts, however, are also fluorescent, indicating a dislocation or loosening of electrons. This leads B. to the assumption that the action of the light is not a complementary oxidation and reduction of different U atoms, but is a rearrangement of the electrons within single mols. in such a manner that the mols. become elec. polarized, one terminal of the mol. being positive and the other negative. Both anodic oxidation and cathodic reduction can thus be produced by the same mol. due to the p. d. within itself. The e. m. fs. so generated are calcd. on the basis of the quantum theory and are of the order of 2.4 v. for yellow light, 3.2 v. for blue, 5.5 for ultra-violet, and about 100,000 v. for the shortest  $\gamma$ -rays. On this conception the action of the fluorescent dyestuffs in sensitizing other reactions is due to simultaneous oxidation and reduction. The decompn. of Eder's soln. in light by eosin is represented as:



and the sensitizing action of quinine on the oxidation of HI by O in light is



The same interpretation is given to a number of newly demonstrated photochemical oxidations and reductions, including:  $\text{HgCl}_2$  + cane sugar by uranyl salts in light; oxidation of eosin by  $\text{HgCl}_2$  in light; the oxidation from ferrous ion to ferric by  $\text{HgCl}_2$  in the presence of rhodamine in light; the photochemical oxidation of uranyl

formate; the self-electrolysis of AgCl in light to produce its constituent atoms; the photochemical formation of HCl and of ozone.

G. L. WENDT.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

**Recent hydroelectric development in Tasmania.** L. W. ALWYN SCHMIDT. *Elec. World* 73, 75-6(1919).—There are 70,000 h. p. now available. This has given birth to a new electrochem. center (Zn, carbide, etc.). The elec. features of the plant are described at length.

C. G. F.

**Developing our electrochemical resources.** C. G. SCHUEDERBERG. *Elec. J.* 16, 3-5(1919).—A general survey in which the author, in his characteristic forceful style, points out the national economic importance of fostering and expanding our electrochem. industries.

C. G. F.

**Electrochemistry and electrometallurgy.** ANON. *Elec. Rev.* 74, 9-10(1919).—A brief review covering elec. furnaces, ferro-alloys, brass, Cottrell process, potash, etc.

C. G. F.

**The electrochemical industry of Italy.** F. PFITZNER. *Z. angew. Chem.* 30, I, 321; *Elektrotechn. Z.* 39, 265(1918).—A review. The industry has more than doubled its total output of electrochem. products within the last 8 yrs.  $\text{CaC}_2$ , caustic, bleaching powders, hypochlorites, Cl, N fixation (Pauling), cyanamide, ferro-Si, Si and Ba salts are among the chief products of Italy. Details are given.

C. G. F.

**Notes on electric-furnace problems.** J. L. MCK. YARDLEY. *Bull. Am. Inst. Mining Eng.* 1918, 1593-8.—Two general classes of elec.-furnace problems are cited: (1) those relating to the best utilization of the elec. power inside the furnace; and (2) those connected with the bringing of the elec. power to the point where it is to be utilized. An example is given showing a method for detg. the max. capacity and approx. performances of a new furnace to operate at 160 v. on a 60-cycle circuit. Plenty of test data should be available for checking purposes.

W. E. RUDER.

**The status of the electric steel industry.** EDWIN F. CONE. *Iron Age* 103, 60-2 (1919).—A review giving particulars as to every important elec. steel furnace in the world. There are over 800 elec. steel furnaces operating throughout the world to-day, 287 in U. S., of which number over  $1\frac{1}{2}$  are Heroult. Great Britain is next to U. S., the largest elec. steel producer.

C. G. F.

**The electric smelting furnace of Grönwall-Dixon.** CARL IRRESBERGER. *Stahl u. Eisen* 38, 90-2(1918).—This furnace was originally designed by Grönwall and used in Sweden for smelting ores. Then it was introduced into U. S. and modified there by Joseph L. Dixon. Construction and operation of the furnace are described and the favorable results obtained at the Works of the Railway Steel Spring Co. in Detroit are recorded. The Grönwall-Dixon furnace seems to be an improvement in elec. smelting and steel manufacture. Diagrams are shown.

TH. VERHEGGEN.

**The great electric steel works at Ugine.** ANON. *J. four électrique* 27, 193-4 (1918).—The plant comprizes an elec. steel found ry, a ferro-alloy foundry and an electrode factory. The capacity of the elec. furnaces is 60,000 tons per yr. Details are given.

C. G. F.

**The design and operation of a small Kjellin furnace.** GEO. H. STANLEY AND W. BUCHANAN. *Met. Chem. Eng.* 18, 349-53(1918).—A description of the Kjellin elec. induction furnace installed on the Witwatersrand, S. Africa, for the manuf. of elec. steel castings for stamp-mill shoes and dies. Instead of elaborate water-cooling, air

circulation alone is depended upon for cooling the coil. An asbestos-board ventilating cowl is placed over the center and connected with the flue. Monel metal was used in the construction wherever possible to cut down undesirable magnetic fields. A tar-chromite lining was found best. The furnace was started with a charge of molten cast Fe. The chief furnace trouble has been the formation of a crust of solid metal. The product so far has been non-uniform in C content and the castings have been imperfect, but with increased experience these defects are being overcome.

W. E. RUDER.

**Application of the electric furnace to the metallurgy of iron and its alloys.** H. ETCHILLS. *Electrician* 81, 734(1918).—An address. C. G. F.

**Development of an electric furnace for annealing, treatment and forging of steel.** WIRT S. SCOTT. *Chem. Met. Eng.* 19, 86-9(1918).—See C. A. 12, 2165. C. G. F.

**Copper extraction from pyritic ashes.** ANON. *Eng. Mining J.* 106, 987(1918).—A new method for the electrolytic extn. of Cu from pyritic ashes, described in *L'Industrie*, is based on the electrolytic conversion of CuS or CuSO<sub>4</sub> into CuCl<sub>2</sub> or CuCl by the action of Cl at the anode. If in an electrolytic bath containing HCl in soln. the anode is surrounded by a mass of pyritic scoria, the Cl liberated by the H attacks the oxides, sulfates, or sulfides of Cu more rapidly than it attacks the oxides of iron, and combines with them to form CuCl<sub>2</sub>. Cu loss by this method is only 0.1% C. G. F.

**The present status of electric brass melting.** H. M. ST. JOHN. *Chem. Met. Eng.* 19, 321-8(1918); cf. C. A. 12, 1439.—A survey of the applications of elec. furnaces to the melting of brass and other Cu alloys. The advantages and disadvantages of different types of furnaces are discussed. Of the 4 types of elec. furnaces in com. use, only two are suitable for use with alloys high in Zn. One, the vertical-ring induction furnace, is of high efficiency, but is somewhat limited as to its application and is not flexible enough for general foundry work. The indirect resistance, indirect radiation furnace is less efficient and has a lower rate of production in proportion to its holding capacity, but is more flexible and better suited for general foundry work. Elec. crucible furnaces are reliable and effective, but in this field give little hope of profitable application except under unusual conditions. Cf. Bailly furnace, C. A. 12, 1859. W. E. RUDER.

**Nitrogen-fixation furnaces.** E. KILBURN SCOTT. *Trans. Am. Electrochem. Soc.* 34, preprint; *Gen. Elec. Rev.* 21, 793-803(1918); *Chem. Met. Eng.* 19, 411-4(1918).—Furnaces for the fixation of N are classified into 3 groups depending upon the means employed to direct the arcs and typical well known furnaces of each type are described. The effect of phase, balance, starting losses, electrodes, stability of the arc, power factors, air supply, cooling the gas, preheating, absorption, etc., are described. Diagrams and sketches are given showing furnaces, arcs and elec. characteristics.

W. E. RUDER.

**Electrical features of Muscle Shoals nitrate plant.** ANON. *Elec. Rev.* 74, 52 (1918).—The installation includes a 70,000 K v a 12,000 volt turbine. C. G. F.

**Aluminium (bauxite) deposits and the production of aluminium.** ANON. *Engineering* 106, 163, 191, 218(1918).—Due to the shortage of Cu, the use of Al has been considerably extended. The Hungarian bauxite deposits of the Jurassic period are variously estd. at from 18 to 30 million tons. A table is given of the analysis of bauxite from 25 different sources, varying in Al<sub>2</sub>O<sub>3</sub> content from 29 to 69%, the principal impurities being SiO<sub>2</sub> and Fe<sub>2</sub>O<sub>3</sub>. A rather complete summary is given of various uses of Al and processes for its manuf. with some statistics as to the world distribution of Al manuf. W. E. RUDER.

**Aluminium as a substitute for copper for transmission lines.** M. WYSSLING. *Bull. soc. Elec. suisse* 7, 117(1918); *Elektrotechn. Z.* 39, 258(1918).—A review.

C. G. F.

**Commercial uses of chlorine.** V. R. KOKATNUR. *Trans. Am. Electrochem. Soc.* 34, preprint; *Chem. Met. Eng.* 19, 667-71(1918).—A very comprehensive review of the present and possible uses of Cl and Cl compds. in metallurgy, warfare, inorg. salts, org. solvents, pharmaceuticals and intermediates.  $\text{SiCl}_4$  and  $\text{TiCl}_4$  were largely used in smoke screens. Among the gases used in warfare, more than 50% were Cl compds. and probably 95% were made directly or indirectly by the use of Cl. Chloroacetone, trichloromethyl chloroformate ( $\text{ClCOOCCl}_3$ ), called superpalite and phenyl-carbylamine chloride ( $\text{C}_6\text{H}_5\text{NCCl}_2$ ), were used as lachrymators. Benzyl chloride and chloropicrin ( $\text{C}(\text{NO}_2)_3$ ) found use as tear gas. Mustard gas (dichlorodiethyl-sulfide) and "sneezing gas" (diphenylchloroarsine) were also much used. As org. solvents Cl compds. are of great value. The most extensively used is  $\text{CCl}_4$ ;  $\text{CHCl}_3$ ,  $\text{C}_2\text{H}_5\text{Cl}$ , "Dutch Liquid" and  $\text{CH}_3\text{OHCH}_2\text{Cl}$  are examples of widely used solvents. Tetrachloroethylene is an ideal dry-cleaning solvent. The problem of turning this vast primary by-product to man's service in times of peace is one which must be promptly met by manufacturers.

W. E. RUDER.

**Electrolytic refining of antimony.** Y. C. WONG. *Chem. Met. Eng.* 19, 509(1918).—The extg. soln. was prepd. by the reaction  $3\text{CaO} + 4\text{S} = 2\text{CaS} + \text{CaS}_2\text{O}_3$ . Several 40-cc. portions of Sb exts. were added, giving on analysis 0.962 g. of Sb to which were added 15 cc. of CaS (d. 1.18), 1 g. NaCl, 4 cc. of 10% NaOH soln., and the whole was dild. to 400 cc. with hot  $\text{H}_2\text{O}$ . The cathode was a Pt cylinder of 39.3 sq. cm. surface and the anode a Pt spiral. With a voltage of 1 to 1.2 and a current of 0.4 amp., 90% of the Sb was deposited in 1 hr. Too much NaOH will give a black non-coherent deposit. The cost of refining by this process is estd. at 5 c. per lb. W. E. RUDER.

**The Siemens-Billiter process.** J. NUSSBAUM. *Z. Elektrochem.* 24, 50-2(1918).—Polematical.

C. G. F.

**Effect of cold upon battery performance.** KENNEDY RUTHERFORD. *Elec. Rev.* 71, 718-9(1918).—R. points out that the decrease in available capacity with lowering of temp. is gradual in the case of the Pb battery but that in the case of the Ni-Fe battery, though gradual down to 5°, it is very rapid from there on. R. suggests that whenever either battery is to be exposed to low temp. for any length of time, it be encased in a double-walled box on the Dewar flask principle.

C. G. F.

**The sign of the potential.** DEUTSCHE BUNSEN GESELLSCHAFT. *Z. Elektrochem.* 24, 40(1918).—The Bunsen Society recommends the negative sign for the Zn electrode, the positive sign for the Ag electrode, etc. (This corresponds to the recommendations of the Am. Electrochem. Soc.)

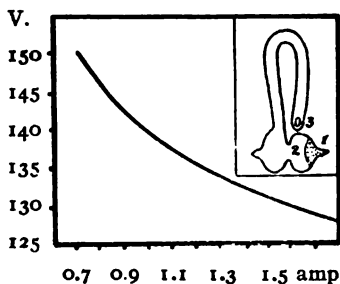
C. G. F.

**Mercury arc rectifiers.** ANON. *Elektrotechn. Z.* 39, 267(1918).—A brief announcement of a new Schott-A. E. G. glass rectifier with a capacity as high as 100 amp. at 250 volts. This is more than any of the present glass rectifiers will carry.

C. G. F.

**A neon arc lamp for direct current.** F. SCHROETER. Berlin. *Z. Elektrochem.* 24, 132-7(1918).—According to Bouty (*Compt. rend.* 138, 1691(1904)) the dielec. cohesion for Ne is lower than that of any other gas. A Moore tube of 20 mm. inside diam. containing Ne gas plus a little He consumed but 0.26 watt per Hefner candle compared with a similar argon Moore tube consuming 45 watts per Hefner c. In the Ne (1 mm. p.) tube the potential drop is distributed as follows: At the electrodes 30 v., Ne arc or luminous column 110 v., resistance in series 80 v. The relation between amperes ( $i$ ) and volts ( $e$ ) is represented by the following equation:  $e = 114 + (26/i)$ ,

for a tube 21 mm. inside diam. containing 1 mm. Ne (+ little He). Including the watt consumption of the rheostat connected in series with the lamp, the efficiency is 0.52 w. per horizontal Hefner candle. Contrary to the behavior of metal filament and Hg vapor lamps, the w. p. c. attains a minimum (at about 0.29 w. p. c. American) and then increases again as the c. d. is increased (curve is shown). The light absorption of Ne is very slight. On account of the low ionization voltage of metal vapors ( $\text{Hg} = 4.9$  vs.  $\text{Ne} = 16$ ) it is necessary to employ a cathode which does not produce these metal vapors. It was found that Tl, as cathode, does not contaminate the Ne column with Tl vapor; Hg, however, does. The alkali metals proved to be the best cathode metals



from a light efficiency point of view but they attacked the walls too rapidly. Skaupy had alloyed the alkali metals with Hg or Tl or Pb (U. S. pat. 120,770). S. improves upon Skaupy's cathodes by using definite compounds, e. g.,  $\text{NaHg}$  and  $\text{NaHg}_2$ . Since the heat of formation of these compounds is very high and the Hg% is high, it follows that the concn. of free Na in the gas phase must be low. By expt. S. found that the walls of the glass tube were but slightly attacked when  $\text{NaHg}$  and  $\text{NaHg}_2$  cathodes were used and the lamps remained clear for several 1000 hrs. The Hg vapor p. was so low that it did not noticeably affect the Ne spectrum. A cathode composed of Cd and Tl (about 82% Tl, m. p.  $200^\circ$ ) was finally found to be most efficient. The lamp shown in the fig. is made of glass: 1 is the Tl-Cd cathode, 2 is the condensing chamber, 3 is an Fe anode, 20 sq. cm. per amp. The tube is filled with gas (75% Ne, 25% He) at 1 mm. p. This gas is practically as efficient as pure Ne. Photometer curves are shown. This Schroeter lamp is in reality a half-watt lamp which will burn brightly for more than 2000 hrs. The lamp does not grow hard since Ne is not occluded. The lamp may find wide application in signal service on account of its penetrating red rays.

C. G. F.

**A neon lamp of low watt consumption for signal and indicator service.** ORRO SCHALLER. Berlin. *Z. Elektrochem.* 24, 131-2 (1918).—There has been an urgent demand in Germany for a lamp which would not consume more than 1 watt and would operate on 220 volt. Neither C nor W filament lamps could be made satisfactorily to meet these specifications. In the new lamp developed, the light is due to a cathodic glow discharge. A small glass bulb about 1 or 2 cm. in diam. is filled with Ne (+ He) gas at 7.6 mm. pressure. The electrodes are Fe, spaced 5 mm. apart. The light intensity is dependent upon the area of the cathode surface and the pressure of the gas. The voltage increases slowly with increase in amp. The voltage drop between terminals is pretty nearly equal to the voltage drop at the cathode since the spacing of the electrodes is so close. No high-tension starting voltage is necessary; the lamp will begin to glow instantly on 220 v. A small resistance is connected in series with the lamp and det. the max. current that will pass through the lamp. About 90% of the emitted Ne light falls within the range  $650\mu\text{m}$  to  $570\mu\text{m}$ .

C. G. F.

**Tungsten crystal wire as glow-lamp filament.** O. ELY. *Z. Ver. deut. Ing.* 62, 15-20 (1918).—After a brief historical review of the first metallic filaments used in elec. incandescent lamps, the different methods of manufacturing filaments for W lamps are stated. The author then describes at length a new patented process (Julius Pintsch Co., Berlin) for the manuf. of filaments made of a long crystal of metallic W. These wires have not only the advantage of a greater flexibility and ductility, but also the property of not becoming brittle after long burning at high temps. (about  $2600^\circ$ ). The

single crystal that composes the filament does not give way to such changes. *Manufacture of tungsten crystal wire:* The  $WO_3$  is pulverized as finely as possible and is completely reduced by heating in a H atm. to produce pure W metal, a brilliant black-brownish metallic powder. To this W is added a carefully detd. quantity of  $ThO_2$ , which addition is of very great importance for the formation of the crystal and the ductility of the wire; finally a colloidal binding material is added in very small quantity. From this doughy mass filaments of various diameters are formed, just as in the old paste processes. After the extended "threads" have been dried at a moderate temp. they are placed, 8 at a time, into the treating app., where the transformation into pure metallic crystals takes place. The treating app. consists essentially of a glass cylinder closed at both ends and provided with two contacts joined by a helix of heavy W wire. The filaments to be treated are passed through the axis of this glowing helix by means of a simple mechanism; during the operation the W helix is traversed by a current of 40 amp. and 25 volts; thus the filaments to be treated are raised rapidly to a temp. of 2600–2700°. A continuous current of reducing gas passes through the glass cylinder. Of very great importance in the formation of infinitely long crystals is the speed with which the filaments are moved through the hot zone. This speed must be less than the speed of crystn. in order to allow the crystal to grow gradually at the expense of the small adjacent crystals. If the linear velocity of the filaments passing through the helix is too great a filament composed of several crystals is obtained; this is very fragile, breaking at the interfaces of the successive crystals. Filaments composed of a single W crystal retain all their good properties even after many hrs. of burning; they retain their ductility and softness and resist vibration and shock, which is not the case with some drawn W filaments. Comparative tests made under the same conditions with a lamp provided with Pintsch W crystal filaments and a lamp provided with drawn W filaments, have shown that after a life of 1200 hrs. the filament made of a W crystal had not given rise to the slightest trace of deposit on the walls of the bulb, whereas the filament of drawn W was more or less disintegrated, the interior of the bulb being covered with a light black deposit; it seems therefore that the new Pintsch process offers an additional advantage on this account. Numerous photomicrographs of the new filaments and some of the old-fashioned filaments are shown.

TH. VERHEGGEN.

Specifications covering supply and life of tungsten lamps. ANON. *Elektrotechn. u. Maschinenbau* 35(1918); through *Sci. Abs.* 21B, 162(1918).—Rules adopted by the Union of Elec. Works to govern the delivery and acceptance of vacuum lamps with non-spiral filaments and standard gas-filled lamps.

W. E. RUDER.

A new hot-filament vacuum gage with amplifier. WM. TSCHUDY. *Elektrotechn. Z.* 39, 235–7(1918), 5 illus.; *Elec. World* 73, 137(1919); cf. *C. A.* 10, 1815; 12, 653.

C. G. F.

Corona losses of high-tension transmission lines. G. HOPPE. *Elektrotechn. u. Maschinenbau* 35, 297, 312(1918); *Elektrotechn. Z.* 39, 249–50(1918). C. G. F.

Carbon brushes. Considered in relation to the design and operation of electrical machinery. P. HUNTER-BROWN. *Electrician* 81, 720, 738(1918). C. G. F.

Automatic copper plating (RICHARDS) 9. Transformer oil (FLIGHT) 22. Checking calibration of thermocouples and pyrometers (ANON). 1. The metallurgy of the arc weld (RUDER) 9. Electrically joined welds (COX) 9.

Dry-cell electric battery. H. R. PALMER. U. S. 1,286,750, Dec. 3. Structural features.

**Electrolytic cell.** L. D. VORCE. U. S. 1,286,844, Dec. 3. The pat. relates to structural features of a cell adapted for electrolysis of NaCl soln. to produce NaOH and Cl.

**Electrolytic apparatus for production of tin fluosilicate from tin anodes.** R. L. WHITEHEAD. U. S. 1,287,156, Dec. 10. An electrolyte of HF is employed and removable cathodes which may be formed of Sn, Cu or Pb are arranged alternating with impure Sn anodes. The cathodes are enclosed in removable porous compartments which serve as diaphragms between them and the anodes and prevent deposition of Sn on the cathodes.

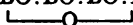
**Electric furnace.** O. SAHLIN. U. S. 1,286,794, Dec. 3. The furnace is of the arc type and is adapted for smelting or refining metals.

**Calcium cyanamide.** AKTIEBOLAGET NITROGENIUM. Swed. 43,668, Feb. 20, 1918. Before introduction into the furnace, the  $\text{CaC}_2$  is mixed with an inactive material to increase the m. p. of the mass, and prevent sintering. The mass is also rendered less compact, and the amt. of catalyzer required to accelerate the reaction is less. The addition of inactive material does not exceed 35% of the wt. of the carbide. Cf. also 43,666, Feb. 20, 1918, similar process.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

**The compound  $\text{H}_2\text{B}_4\text{O}_6$  and its salts.** R. C. RAY. *J. Chem. Soc.* 113, 803-8 (1918); cf. *C. A.* 9, 276.—Expts. are described having for their object the isolation of a lower oxide of B, believed from the previous work to be present in so-called amorphous boron. A mixt. of Mg and  $\text{B}_2\text{O}_3$  (1:3.5) was heated for 3 hrs. to bright redness in a current of H in a MgO-lined crucible. After it had cooled in H, the mass was powdered, mixed with half its weight of  $\text{B}_2\text{O}_3$ , heated again as before, powdered, and left in contact with water 1-3 days to remove traces of  $\text{Mg}_3\text{N}_2$ . The soln. was filtered and boric acid removed by shaking *in vacuo* for several days with pptd.  $\text{Mg}(\text{OH})_2$  and filtering off insol.  $\text{Mg}(\text{BO}_2)_2$ . In analysis advantage was taken of the fact, previously discovered, that solns. of lower oxides of B when evapd. with excess of lime and the residue ignited to const. wt., are not oxidized and the increase in wt. corresponds to the wt. of lower oxide in soln. In 5 solns. each from a different fusion, the ratio B/Mg was closely 4 in all cases and the ratio  $\text{B}_2\text{O}_3/(\text{residue less MgO})$  varied from 1.112 to 1.132, average 1.124, while  $2\text{B}_2\text{O}_3/\text{B}_4\text{O}_6$  is 1.129. Another prepn. was treated with water four times and the exts. were analyzed separately. Although the solns. became more and more dil., their compn. remained practically const., leaving no doubt that a compd.,  $\text{MgO} \cdot \text{B}_4\text{O}_6$ , was present. Mol. wt. detd. from the f. ps. of the solns. assuming 75% ionization agreed well with the theory. This compd. could not be isolated, but on treatment with the equiv. of KOH and evapn. *in vacuo* to small bulk practically all Mg sepd. On further concn. *in vacuo* the K salt sepd. as a crust and was purified by several recrystns. and dried *in vacuo* at 80-90°. It is stable in absence of moisture. Analyses and mol. wt. detns. agreed well with the formula  $\text{K}_2\text{B}_4\text{O}_6$ . If the B atoms are linked in a single chain, the oxide must be given the formula  $\text{BO}:\text{BO}:\text{BO}:\text{BO}$  and the acid the formula  $(\text{HO})\text{BO}:\text{BO}:\text{BO}:\text{BO}(\text{OH})$ .



A. R. MIDDLETON.

**Fusion of sodium hydroxide with some inorganic salts.** M. C. BOSWELL and J. V. DICKSON. *J. Am. Chem. Soc.* 40, 1773-9 (1918).—Reactions were found to take place involving decompn. of water, one mol. of O going to effect oxidation and two mols.



of H being either evolved or fixed. With  $\text{NaAsO}_2$  and  $\text{FeSO}_4$  the extent of oxidation was found equivalent to the H evolved; with  $\text{SnCl}_2$  and  $\text{V}_2(\text{SO}_4)_3$  much H was evolved; with  $\text{Ce}(\text{SO}_4)_3$  a less amt.; with  $\text{U}(\text{SO}_4)_2$  only a small amt. Neither  $\text{NaNO}_2$  nor  $\text{Na}_2\text{SO}_3$  was oxidized.

A. R. M.

**Action of sodium hydroxide on carbon monoxide, sodium formate and sodium oxalate.** M. C. BOSWELL AND J. V. DICKSON. *J. Am. Chem. Soc.* 40, 1779-86(1918).—CO heated with excess of NaOH at temps. at which formate is transformed to oxalate was oxidized almost quant. to carbonate with evolution of approx. an equiv. amt. of  $\text{H}_2$ . At temps. far below those at which formate and oxalate alone are decompd. NaOH carries both of them almost quant. to carbonate with evolution of the equiv. amt. of  $\text{H}_2$ . In a discussion of the general reaction involving replacement of carboxyl by H in alk. fusions, e. g.,  $\text{CH}_4$  from  $\text{AcONa}$ ,  $\text{C}_6\text{H}_6$  from  $\text{BzONa}$ , a probability is shown that simultaneous oxidation and reduction by the elements of water are involved.

A. R. MIDDLETON.

**Preparation and properties of aniline chlorostannate.** J. G. F. DRUCE. *Chem. News* 117, 346-8(1918); cf. *C. A.* 12, 1622; 13, 99.—Ten g. nitrobenzene, 15 g. tin and 80 cc. concd. HCl, added in 10-cc. portions, were warmed until the metal had dissolved. On cooling at this stage  $\frac{2}{3}$  of the tin was left as  $\text{SnCl}_4$ — $2 \text{C}_6\text{H}_5\text{NO}_2 + 3\text{Sn} + 14\text{HCl} = (\text{C}_6\text{H}_5\text{NH}_2)_2\text{H}_2\text{SnCl}_4 + 2\text{SnCl}_4 + 4\text{H}_2\text{O}$ —but upon adding 200 cc. warm dil. HCl and 18 g. aniline a nearly quant. yield was obtained. If  $\text{SnCl}_2$  be used instead of the metal, reduction is complete in less time but more uncombined  $\text{SnCl}_4$  remains in soln. The equation is  $2\text{C}_6\text{H}_5\text{NO}_2 + 6\text{SnCl}_2 + 14\text{HCl} = (\text{C}_6\text{H}_5\text{NH}_2)_2\text{H}_2\text{SnCl}_4 + 5\text{SnCl}_4 + 4\text{H}_2\text{O}$ . The chlorostannate could also be obtained by shaking aniline with twice its wt. of  $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$  and by reducing azobenzene and hydrazobenzene with  $\text{SnCl}_2$  and HCl. Anhydrous aniline chlorostannate is colorless when pure, m.  $293^\circ$ , with slight decompn.; 100 cc. water at  $16^\circ$  dissolves 28 g.; the soln. hydrolyzes only when boiled some time or after standing several days; a few drops of dil. HCl or  $\text{HNO}_3$  prevents or greatly retards sepn. of tin oxide. The HCl soln. darkens on keeping, particularly in sunlight, and becomes black and opaque; a little nitrobenzene hastens the darkening and the color is removed by warming with  $\text{SnCl}_2$  soln. or with Zn; the dark compd. is sol. in  $\text{Et}_2\text{O}$ . Aniline chlorostannate is sol. in  $\text{EtOH}$ , insol. in  $\text{Et}_2\text{O}$ ,  $\text{CHCl}_3$ ,  $\text{CCl}_4$ ,  $\text{C}_6\text{H}_6$ , ligroin and glacial AcOH. Addition of a few drops of  $\text{K}_2\text{Cr}_2\text{O}_7$  soln. to a soln. of the salt in concd.  $\text{H}_2\text{SO}_4$  produces an intense blue color; addition of aq. soln. of the salt to a soln. of bleaching powder produces an intense violet color; aq. and dil. acid solns. give a bright yellow color when dropped on paper or wood; pure filter paper is not colored. Total Cl in the compd. could be detd. by titration with 0.1 N NaOH and phenolphthalein. The salt can be used in Skraup's synthesis of quinoline instead of aniline and nitrobenzene with improved yield and fewer operations. To 50 g. each of aniline chlorostannate and glycerol 50 g. concd.  $\text{H}_2\text{SO}_4$  was slowly added and the mixt. heated gently for 1 hr.; the soln. was cooled, dild. with 400 cc. water and  $\text{NaNO}_2$  soln. added till starch-KI gave a blue color, allowed to stand 1 hr., then boiled 20 min., cooled and made alk. with NaOH, distd. with steam and extd. with  $\text{Et}_2\text{O}$ ; this gave 20 g. quinoline, 80% of theoretical. *o*-Toluidine chlorostannate, prepd. from *o*-nitrotoluene similarly to the aniline salt, also gave a good yield of 8-methylquinoline by the above modification of Skraup's synthesis.

A. R. MIDDLETON.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**A process of determining metals by electrodeposition without the use of external electric energy.** M. FRANÇOIS. *Compt. rend.* 167, 725-7(1918).—The method,

based on the formation of a voltaic cell, requires the following app.: (1) a 20 to 25 cc. Pt crucible; (2) a sheet of Ni about 0.5 mm. thick, 60 mm. long, and 12 mm. wide with a 3 mm. notch or "fork" about midway; (3) a pure Zn rod about 5 mm. in diam. and 40 mm. long with notches about 3 mm. from one end to fit in the "fork" in the Ni sheet. This rod is amalgamated at least 24 hrs. before use (to prevent secondary currents due to impurities) and is wrapped with a filter paper which is held in place by thread. The Ni sheet is placed across the Pt crucible and the Zn suspended so as to dip into the soln., but not touch the bottom of the crucible; Al may be substituted for the Zn. F. has applied the method to the detn. of Au, Ag and Hg. To det. Au or Ag, place in the crucible 2 cc.  $H_2O$  (to dissolve the Au or Ag salt), 9 cc. of 10% KCN soln., 5 cc. of KOH soln. ( $36^\circ$  Bé.), and 2 cc. of  $NH_4OH$  ( $22^\circ$  Bé.); for the Hg detn. the crucible contains 20 cc. of 10%  $H_2SO_4$  and 0.5 g. of KI. In each case the operation required 24 hrs. F. states that exact results are obtained, but gives no data. In detg. Ag the av. intensity of the current during the first 45 min. of the operation is 7 milliamp., the current density on the crucible is 23 milliamp. per square decm.; with Hg the figures are 33 and 110.

F. W. SMITHER.

**Sampling.** F. W. BUNYAN. *Mining Sci. Press* 117, 827-32 (1918).—The relation is shown between efficient sampling of raw materials and the chem. control of their manuf., and also the necessity for the producer to use representative means of sampling to obtain the value on which to base the sale of his product so that, when the purchaser takes fresh samples, in an efficient manner, there will be no wider discrepancy in results. Cases are cited of "grab sampling" and of sampling from chutes, cars and elevators and it is shown wherein the human element, intentionally or otherwise, plays a large part in making the samples unreliable. The difficulty of obtaining representative samples from material containing a considerable quantity of "fines," is overcome by the use of mechanical samplers wherever possible and when sampling cars or piles, portions are taken from all over in such a way that the material at the bottom of the car or pile is obtained as well as that at the top and the total sample equals 3 or 4% of the bulk.

J. E. CLARK.

**The importance of particle-size reduction before sampling for assay.** A. W. ALLEN. *Eng. Mining J.* 106, 1103-5 (1918).—The necessity is emphasized of reducing the size of particles in ore feeds or mine runs to such a size that the values are more evenly distributed and samples for assay, taken from two or more parts of the feed, will give concordant results, instead of taking the usual head and tail samples of the coarse material and calcg. the complementary figure required to give a metal recovery estn. Samples taken from residues or tailings are usually reliable as the material is finely ground and intimately mixed during mechanical reduction and conveyance.

J. E. CLARK.

**Quantitative separation of iron from the cerite metals in the presence of calcium.** A. WÖBER. *Z. landw. Versuchsw.* 20, 500-1; *J. Chem. Soc.* 114, II, 243.—After soln. by prolonged treatment in 2% HCl, tartaric acid in proportion of approx. 4 g. to 1 is added to an aliquot; Fe is pptd. by satg. with  $H_2S$  and then adding  $NH_4OH$ ; hydroxides of the cerite metals are redissolved. The  $FeS$  is treated in the usual manner, and the cerite metals are detd. by the method of Hauser and Wirth.

R. B. DEEMER.

**A note on the precipitation of zirconium phosphate.** G. STRIGER. *J. Wash. Acad. Sci.* 8, 637-9 (1918).—A note on work done to det. the conditions necessary when applying this method to the analysis of rocks. As the main object of this pptn. was the sepn. of Zr from Ti, Fe, and other metals in a rock, no effort was made to det. the conditions under which Zr phosphate of const. compn. may be pptd. In detg. amts. of Zr so small as those found in the av. rock the analyst can obtain results that are suffi-

ciently accurate by assuming that the compn. of the ignited phosphate is  $\text{ZrP}_2\text{O}_7$  ( $= 46.32\% \text{ ZrO}_2$ ). S. states that "it is not safe to base definite conclusions on the results of work involving quantities so small as those used in these expts., but those results indicate the formation of a basic salt that approaches normal Zr phosphate as the acidity of the soln. is increased." Results reported (in a table) indicate that the soln. used may safely contain at least 3% and perhaps as much as 5% of free  $\text{H}_2\text{SO}_4$ .

F. W. SMITHER.

The uses of cinchonine in the assay of tungsten minerals. H. W. HUTCHIN. *Bull. Inst. Mining Met.* 164, 14 pp.(1918).—A review and discussion of the  $\text{HgNO}_3$  and cinchonine methods, followed by an exptl. study. The scope of the paper is restricted to the assay of the poorer Cornish products. From expts. with synthetic mixts. to det. the effects of vol., acidity, temp., Fe, P, As, and varying amts. of  $\text{WO}_3$ , H. concludes that the best conditions for the pptn. of cinchonine tungstate from solns. of alkali bases are (1) a minimum of acidity, (2) a vol. of 100 cc. to 200 cc., (3) warm soln., (4) standing overnight preferably. The ppt. should be washed with a weak soln. of cinchonine-HCl; Mo is pptd. under similar conditions. The considerable solvent effect of Fe under the synthetic conditions was contrary to the experience with actual assay liquors. The polymerization of  $\text{WO}_3$  in acid solns. under the conditions of an assay explains the different behavior under slightly different conditions. The pptn. of  $\text{WO}_3$  from the Fe liquors of an acid attack is rarely complete. H. outlines methods based on the use of cinchonine: (1) Acid attack; ores and tailings (under 1%  $\text{WO}_3$ ); (2) acid attack; intermediate concentrates, calcined or uncalcined. (3)  $\text{NaOH}$  (25%) digestion attack; ores, tailings, uncalcined intermediate products. (4)  $\text{Na}_2\text{O}_2$  fusion method completing the detn. by the cinchonine or  $\text{HgNO}_3$  methods. Where a preliminary evapn. with HF has been made, the fusion with  $\text{Na}_2\text{O}_2$  will result in the presence of considerable amts. of sol. fluoride in the Na tungstate solns. In such circumstances the  $\text{HgNO}_3$  method is better. H. recommends the following method as an alternative to fusion with  $\text{Na}_2\text{O}_2$ , a very good method for calcined Cornish intermediate concentrates irrespective of the type of calciner: Mix 1 g. with 2 to 3 g. of  $\text{CaCO}_3$  and transfer to an alundum crucible lined with  $\text{CaCO}_3$ ; ignite in a hot Sn furnace for 15 min., let cool, place in a 4-in. porcelain dish, slake with a little  $\text{H}_2\text{O}$ , cover, and add 20 cc. concd. HCl. When action ceases, wash off the cover glass, add 5 cc. of 5% cinchonine solns., and evap. to dryness or until just pasty. Add 2 cc. HCl and about 20 cc. of  $\text{H}_2\text{O}$ , warm on  $\text{H}_2\text{O}$  bath, let stand till cold, then filter through ordinary paper and wash with weak cinchonine soln. Transfer the ppt. from the paper to a beaker, rinse the dish with warm dil. NaOH soln. and pour over the paper, finally washing with small portions of  $\text{H}_2\text{O}$ . Add a little more dil. NaOH soln. to the beaker, boil, add  $\text{NH}_4\text{NO}_3$ , etc., as for  $\text{HgNO}_3$  pptn. For the assay of poorer products, with more pronounced impurities of As and  $\text{CaF}_2$ , cinchonine is invaluable; As and P cease to be disturbing factors. Other methods such as ignition with CaO, or CaO and  $\text{NH}_4\text{Cl}$  followed by an acid attack, become distinctly sound methods when cinchonine is used. The choice of methods will depend upon the nature of the product (material ranging from 0.65% to 70%  $\text{WO}_3$ ). Whatever the final choice of method, it is essential to save the  $\text{WO}_3$ , and when several hundred mg. have accumulated to det. its purity. Aq. HF attacks both scheelite and wolfram in fine powder, the former about 95%, the latter about 30%. It is not advisable to acidify the residue from HF evapn. with acid and filter, since a serious loss of W may occur through soly. The fusion methods are attended with difficulties when considerable amts. of arsenical mineral and other sulfides are present. A preliminary calcination is the safest procedure. The most suitable methods where scheelite is present are those based on acid attack or fusion with alkalis, the least suitable are the methods based on digestion with caustic alkali.

The one essential to success with the digestion methods is sufficiently fine powdering of the sample; KOH is better than NaOH. The results obtained by the different methods on various products are reported and discussed at some length. F. W. SMITHER.

**The wet assay of low-grade tin ores.** H. W. HUTCHIN. *Bull. Inst. Mining Met.* 164, 6 pp.(1918).—A comparative study reported in detail, of the CaO, Beringer, and Pearce methods as applied to Cornish ores. Preliminary expts. with  $\text{SnCl}_4$  soln. showed that Sn ores can be evapd. with HF in the presence of HCl and  $\text{NH}_4\text{Cl}$  without loss of  $\text{SnCl}_4$  by volatilization. H. concludes that while good work can be obtained with any of the 3 methods, the Beringer assay is the most suitable from many points of view. For exact work and as a precautionary measure the retreatment of residues is necessary.

F. W. SMITHER.

**The quantitative determination of gold, especially in animal tissue.** SIDNEY M. CADWELL AND GLADYS LEAVELL. *J. Am. Chem. Soc.* 41, 1-12(1919).—Method and results are given whereby Au is detd. very accurately (electrolytically) in solns. of animal tissues even if Cu and Fe are present. Concns. must be low—about 1 in 20,000.

ERLE M. BILLINGS.

**Sampling and analysis of chromite.** A. A. HANKS. *Mining Sci. Press* 117, 654-5(1918).—Representative samples 40-60 lbs. should be crushed to  $\frac{1}{2}$  in., quartered 10-12 lbs., rolled to 12-16 mesh, and then cut down to 1 lb. The whole lb. should be pulverized in a disk grinder or other machine to 100-150 mesh, and dried to const. wt. at  $100^\circ$ . The standard method of analysis is described in text-books of Low, Scott and Blasdale. The following rapid method is in use at the Berkeley Expt. Sta., U. S. Bureau of Mines: Weigh 0.5 g. 100-mesh sample, brush into a 20-cc. spun iron crucible contg. 4-5 g.  $\text{Na}_2\text{O}_2$  (tech.). Mix well with a glass rod, cover with a little  $\text{Na}_2\text{O}_2$ , fuse at a low red heat, and keep molten for 5 min. Allow to cool, place in a 600-cc. beaker (low expansion glass) or large casserole, add  $\text{H}_2\text{O}$ , digest until the fused mass is disintegrated; then remove and rinse the crucible, boil 10 min. to decompose  $\text{Na}_2\text{O}_2$  (this saves time and there is no interference unless Mn is present). Without filtering, neutralize the soln. with 1:4  $\text{H}_2\text{SO}_4$  or 1:1 HCl and add 25-30 cc. in excess. Dil. to approx. 400 cc., cool and titrate with standard  $\text{FeSO}_4$  (about 0.2 N; 56-60 g.  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  in 800 cc.  $\text{H}_2\text{O}$ , 100 cc.  $\text{H}_2\text{SO}_4$ , cool, dil. to 1000 cc.). Add a slight excess of  $\text{FeSO}_4$  soln. as shown by spot plate tests with  $\text{K}_3\text{Fe}(\text{CN})_6$  and finish by titrating back with 0.2 N  $\text{K}_2\text{Cr}_2\text{O}_7$  soln. (9.806 g. c. p.  $\text{K}_2\text{Cr}_2\text{O}_7$  per l.). The  $\text{FeSO}_4$  soln. may be standardized against the  $\text{K}_2\text{Cr}_2\text{O}_7$  soln., or a  $\text{KMnO}_4$  soln. based on Bureau of Standards  $\text{Na}_2\text{C}_2\text{O}_4$ .

H. M. LANCASTER.

**A rapid method for determining titanium and chromium in beach sand.** E. P. BARRETT. *Mining Sci. Press* 117, 729-30(1918).—Weigh 0.5-1 g. 150-mesh ore into a porcelain crucible containing 6-8 g.  $\text{Na}_2\text{O}_2$ , mix and fuse over a Meker burner, holding the crucible in the tongs so as to rotate the contents after fusion begins. Heat slowly at first. If a perfect fusion is not obtained in 5 min., cool, add a little more  $\text{Na}_2\text{O}_2$  and heat again. Place the crucible in a 600-cc. beaker contg. about 400 cc.  $\text{H}_2\text{O}$ , place on a hot plate and boil for at least 15 min. Cool in a tray of running water (10 min. sufficient), filter and wash with dil. NaOH. The residue contains all the Ti and Fe; the filtrate contains Cr and may be used for its detn. Wash the residue through the filter with hot 10%  $\text{H}_2\text{SO}_4$ , wash well with hot  $\text{H}_2\text{O}$ , add 10 cc. HCl, the total vol. of the soln. being now about 100 cc. Proceed with the Shimer method (8th Internat. Congr. App. Chem.) as modified by Scott (text-book—Stand. Methods Chem. Anal.). The method may also be used to det.  $\text{Cr}_2\text{O}_3$  in chromite. Such an assay may be made in about 1 hr. If only  $\text{Cr}_2\text{O}_3$  is to be detd. use an iron crucible for the fusion.

H. M. LANCASTER.

**Sulfur dioxide method for determining copper minerals in partly oxidized ores.** C. E. BARNEVELD AND EDMUND S. LEAVER. *Bur. Mines, Tech. Paper* 198, 12 pp. (1918).—See *C. A.* 12, 1032. E. H.

**Potassium determination by perchloric acid.** GENESSEE CHEMICAL CO. *Chem. Analyst* 26, (1918).—Producers of potash, consumers of potash (mfrs. of glass, explosives, fertilizers, matches, dyes) as well as research and teaching institutions have adopted the perchloric acid method. There is considerable economy—3 cents worth of  $\text{HClO}_4$  replacing \$8.00 worth of  $\text{PtCl}_4$ . The Scholl method gives 0.1–0.5% accuracy, depending upon the sample. The manipulations are simple and time required is short. H. M. LANCASTER.

**A study of sources of error incident to the Lindo-Gladding method for determining potash.** T. E. KEITR AND H. E. SHIVER. South Carolina Exp. Station, Clemson College, S. C. *J. Ind. Eng. Chem.* 10, 994–6 (1918).—Although there is a plus error arising from the fact that the vol. of soln. is decreased by the bulk of ppt. formed on addition of  $\text{NH}_4\text{OH}$  and  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ , it is partially compensated by the occlusion of potash by the heavy gelatinous ppt. This occluded potash cannot be washed out with hot  $\text{H}_2\text{O}$ , but may be sepd. to a certain extent by repeatedly dissolving the ppt. in  $\text{HCl}$ , dilg. to a large vol., pptg. with  $\text{NH}_4\text{OH}$  and  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ , filtering and detg. K in the filtrates and washings. Studies of standard solns. of pure salts show that when phosphates of Ca or of Fe are pptd. by  $\text{NH}_4\text{OH}$ , there is occlusion of K. The tendency to occlusion is greater if both Ca and Fe phosphates are present. H. M. LANCASTER.

**Gravimetric analysis. VI. Calcium.** L. W. WINKLER. *Z. angew. Chem.* 31, I, 187–8, 203 (1918); cf. *C. A.* 12, 1177.—(1) *Detn. as Ca oxalate*: To obtain a granular ppt., the soln. must be boiling hot, acid with  $\text{AcOH}$ , and contain considerable  $\text{NH}_4\text{Cl}$ . To the neutral soln., 100 cc. in vol., containing max. 0.1 g. Ca, add 3.0 g.  $\text{NH}_4\text{Cl}$  and 10 cc. *N* acetic acid. Heat to boiling, add dropwise 20 cc. of 2.5%  $(\text{NH}_4)_2\text{C}_2\text{O}_4$  soln. and boil gently about 5 min. For very accurate work the soln. should stand a day before filtering. Filter, wash with 50 cc. cold  $\text{H}_2\text{O}$ , dry at  $100^\circ$  and weigh as  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ . A table of corrections is given for use when very accurate detns. are desired. When sulfates are present, the ppt. contains important quantities of  $\text{CaSO}_4$ , but the mol. wt. of  $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$  being nearly the same as that of  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ , an appreciable error is avoided. The presence of  $\text{NH}_4\text{NO}_3$ ,  $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{CrO}_3$ ,  $\text{KNO}_3$  or  $\text{KClO}_3$  does not cause error.  $\text{NaOAc}$  causes slightly high results. The influence of Mg will be given in another communication. (2) *Detn. as CaO*: Ppt. as oxalate as above. Let stand till next day, filter and wash with 50 cc. hot water containing  $(\text{NH}_4)_2\text{C}_2\text{O}_4$ . Ignite ppt. and filter moist in a Pt-crucible to  $\text{CaO}$ . The error resulting from traces of  $\text{CaCO}_3$  remaining is compensated by the traces of  $\text{CaC}_2\text{O}_4$  remaining in the soln. Expts. show that cryst.  $\text{CaCO}_3$  (Iceland spar) cannot be transformed into pure  $\text{CaO}$  by blasting several hrs. 56.11–56.13% were found for the residue instead of the calcd. value 56.025%. The presence of sulfates causes high results. (3) *Detn. as  $\text{CaCO}_3$* : While for the detn. of Ba and Sr as carbonate, an addition of  $\text{KNO}_3$  is necessary in order to obtain a granular ppt. from a  $\text{CaCl}_2$  soln. a granular ppt. can be obtained, without addition of  $\text{KNO}_3$ . Heat to boiling the neutral soln. (100 cc. containing not more than 0.1 g. Ca and free from  $\text{NH}_4$  salts) and ppt. with 10 cc. 10%  $\text{Na}_2\text{CO}_3$  soln. Boil for several min., filter next day, wash with 50 cc. water free from  $\text{CO}_2$  and satd. with  $\text{CaCO}_3$ , or with 50 cc. water which containing 1 cc.  $\text{NH}_4\text{OH}$  and some  $(\text{NH}_4)_2\text{CO}_3$  soln., dry at  $132^\circ$ . The following points must be observed: (a)  $\text{NH}_4\text{Cl}$  hinders a complete pptn. of  $\text{CaCO}_3$ . (b) In the presence of  $\text{NH}_4$  salts, a mixt. of  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$  solns. is to be used as precipitant and the soln. must be boiled till all  $\text{NH}_3$  is expelled:  $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{KNO}_3$ ,  $\text{KClO}_3$ ,  $\text{NaC}_2\text{H}_3\text{O}_2$  hardly

influence the results. (c) In the presence of chromic acid the ppt. contains a little of it. Conclusion: The best method for detg. Ca is as oxalate. TH. VERHEGGEN.

**Determination of calcium and magnesium in different saline media.** E. CANALS. *Bull. soc. chim.* 23, 422-30(1918).—An exptl. study reported in detail. In the work reported, 0.1 g. of pure pptd.  $\text{CaCO}_3$  was treated with 15-30 cc.  $\text{H}_2\text{O}$  and sufficient  $\text{HCl}$  to effect soln. The  $\text{CaSO}_4$  method yields exact results by using 2 vols. of 80% alc., avoiding a large excess of  $\text{H}_2\text{SO}_4$ , letting stand 6 hrs., and igniting at a dull red for 5 min. To det. Ca as  $\text{CaCO}_3$ , add 10 cc.  $\text{NH}_4\text{OH}$  and 5 cc. of 10%  $(\text{NH}_4)_2\text{CO}_3$  soln.; let stand 12 hrs. at about  $30^\circ$ , filter, wash with ammoniacal  $\text{H}_2\text{O}$ , dry; ash paper separately and carbonate the ash, finally ignite ppt. and ash at a very dull red for 1 min. Ignition (5 min. at bright red) to  $\text{CaO}$  requires less care and is preferable. To det. Ca as  $\text{CaC}_2\text{O}_4$ , add 10%  $(\text{CO}_2\text{H})_2$  soln. to the boiling acid soln., followed by  $\text{NH}_4\text{OH}$  in slight excess, added dropwise; boil until odor of  $\text{NH}_4\text{OH}$  can no longer be noted, filter hot, and wash with hot  $\text{H}_2\text{O}$ , avoiding an excess. Dry, ignite paper separately and carbonate the ash; ignite ppt. and ash at a very dull red for 5 to 7 min., finally weighing as  $\text{CaCO}_3$ ; or, ignite for 10 min. at a bright red and weigh as  $\text{CaO}$ . C. concludes that the oxalate method (weighing as  $\text{CaCO}_3$  or  $\text{CaO}$ ) is the best, although the other, under the conditions stated, yields exact results. The work is being continued. Cf. Blanchetière, *Bull. soc. chim.* 19, 8(1916). F. W. SMITHER.

**Determination of oxygen in steel.** P. OBERHOFFER. *Stahl u. Eisen*, Feb. 7, 1918; *Iron Age* 102, 1573(1918).—A modification of the Ledebur method. The app. consists of: (1) An electrolytic H generator (a large U-tube containing Ni gauze electrodes and  $\text{KOH}$  soln.); (2) the purification train for the H ( $\text{P}_2\text{O}_5$ -tube, heated quartz spiral containing Pt gauze,  $\text{P}_2\text{O}_5$ -tube); (3) a "Beutell" Hg exhaustion pump; (4) a quartz combustion tube and weighed  $\text{P}_2\text{O}_5$ -U-tube; (5) electric resistance furnace arranged on a guiding rail so that it can be slipped into place when needed. All of the connections are of glass. Nos. 1, 2 and 3 are arranged on a vertical board, and Nos. 4 and 5 on a shelf permanently attached to the board. The temp. is measured by a thermocouple inside the resistance furnace and near the quartz tube; 20 min. at  $950^\circ$  in an atm. of H suffices for a 10 g. sample. A detn. requires about 1 hr. The author gives a table of results of O detns. on basic Bessemer steel, before and after deoxidation, and describes (in the original) how microsections can be subjected to the influence of the H when investigating non-metallic inclusions. F. W. SMITHER.

**Results of further coöperative work on the determination of sulfur in pyrite check sample No. 4.** H. C. MOORE. *J. Ind. Eng. Chem.* 11, 45-9(1919).—A continuation of work previously reported (cf. C. A. 9, 2203; 11, 240). The results obtained in 39 different labs. indicate that the conclusions arrived at for the work of previous years apply equally to that of the past year. F. W. SMITHER.

**Detection and determination of phosphine in hydrogen.** J. SOYER. *Ann. chim. anal.* 23, 221-5(1918).—S. recommends the following methods for the technical examn. of H prepd. from Fe-Si and  $\text{NaOH}$ : *Detection*: After bubbling the H through  $\text{H}_2\text{O}$  contained in a Cloez wash bottle, pass through a plug of glass wool to remove excess  $\text{H}_2\text{O}$ , and then through a glass tube with a Pt tip; ignite, and bring a porcelain cover over the flame; a green coloration indicates  $\text{PH}_3$ . *Spectroscopic examn.* of this chilled flame shows clearly the 3 P lines. On introducing a drop of  $\text{H}_2\text{O}$  (suspended in a loop of wire) into the flame for about  $1/15$  of a sec., sufficient  $\text{H}_3\text{PO}_4$  is obtained to give a yellow ppt. with molybdate reagent. *Determination*: The app. consists of a graduated bell jar (2 to 5 l. capacity) provided with a stopper carrying a T-tube with 2 stopcocks to establish communication with the H reservoir and with the combustion tube. The latter is of quartz (or porcelain), about 40 cm. long, and slightly inclined; through a

stopper in the forward end passes the tube (with a Pt tip) for admitting H from the bell jar. The rear end of the tube is closed by a rubber stopper carrying a glass tube connected with 2 Cloez wash bottles, the latter being connected with a filter pump. The forward portion of the tube is heated to bright redness by means of a bunsen; the posterior end is cooled by means of a cloth mantle over which  $H_2O$  falls dropwise. To operate, aspirate by means of the pump, and connect the bell jar (previously filled with H) with the combustion tube. The H ignites in contact with the hot walls of the tube, the  $PH_3$  being quant. transformed into  $H_3PO_4$ . At the end of the combustion, aspirate a min. or so, transfer to a porcelain dish the condensate in the combustion tube and the solns. in the wash bottles, washing these and the H delivery tube with warm  $H_2O$ . Add 5 g.  $NH_4NO_3$ , evap. to about 40 cc., transfer to a 150-cc. beaker, cool to  $50^\circ$ , add 100 cc. of molybdate soln., and let stand, with frequent stirring, for 2 hrs. at  $40^\circ$ . Filter on tared filters, wash with molybdate soln., then with cold  $H_2O$ , and dry to const. wt. at  $60-70^\circ$ . Wt. of phosphomolybdate  $\times 0.01789$  = wt. of  $PH_3$  contained in the vol. of gas analyzed. Taking the d. of  $PH_3$  as 1.214, then the wt. in g. of the phosphomolybdate  $\times 11.395$  = no. of cc. of  $PH_3$  contained in the vol. of gas examd.  $87.7578 +$  wt. of phosphomolybdate corresponding to 1 l. of the gas = vols. of H containing 1 vol. of  $PH_3$ . Notes: Operating on 100 l. of H a millionth vol. of  $PH_3$  can be detd. gravimetrically by this method; smaller concns. can be detd. colorimetrically. The vol. of air aspirated should always be in excess of that required for the H burned. The optimum amt. of gas to burn depends upon the  $PH_3$  content, e. g., 2 l. for a diln. of  $1/1000$  in vol., 5 l. for  $1/10000$ , 20 l. for  $1/100000$ . With a Pt tube of 1.5 mm. inside diam., 20 l. of H can be burned in less than 1 hr. The method can be rendered more exact by measuring the gas over Hg instead of  $H_2O$ .

F. W. SMITHER.

Copper sulfate as an indicator for alkalinity in nitrogen distillation. J. H. ROOP. *Chem. Analyst* 26, 8(1918).—When beginning the Kjeldahl digestion with  $H_2SO_4$  and  $Na_2SO_4$  or  $K_2SO_4$ , add 0.2 g. powdered  $CuSO_4$ . The clear soln. will turn blue when alkali has been added in quantity sufficient to liberate the  $NH_3$  for distn.

H. M. LANCASTER.

Some methods for the quantitative determination of nitrite and nitrate in presence of one another. ALICE OELSNER. *Z. angew. Chem.* 31, I, 170-2, 178-9(1918).—For bacteriological analysis one should have at one's disposal several methods for estg. nitrites and nitrates. The usual methods are: (A) Colorimetric methods of Tillner and Sutthoff, and of Letts and Rea; (B) Gasvolumetric methods of P. Gerlinger, Pellet, de Koninck, Boullanger and Massol, Meisenheimer and Heim, Winogradsky; (C) a method deduced from these by Oelsner; (D) precipitation methods of Busch, F. Hahn; (E) Ester method of Fischer and Steinbach. Oelsner's method is analogous to that of Winogradsky but has the advantage of not requiring a gas analysis. The soln. containing nitrite and nitrate is first titrated according to Lunge with  $KMnO_4$  in sulfuric acid soln. Because of the volatility of nitrous acid, the titration is made by running the soln. of nitrite, from a buret, into a measured quantity of  $KMnO_4$  (0.02 N) soln. acid with  $H_2SO_4$ , diluted with water and heated at  $40^\circ$ . The last drops must be added slowly because the change of red into colorless always requires a little time. After decoloration, it is best to titrate back with  $KMnO_4$  soln. The nitrate produced is detd. by reducing to  $NH_3$  by Zn and Fe in alk. soln. The nitrate is detd. by difference. For the nitrate detn. it is necessary according to Seydel and Wichers [*Z. angew. Chem.* 24, 2046(1911)] to use 10-30 mg. nitrate-N for the assay; less than 10 mg. gives too much nitrate, more than 30 mg. too little. Hence more soln. is required for the nitrate than for the nitrite detn. Detns. made by this method upon  $NaNO_3$  soln. containing 28 mg. N in 100 cc. show that the results obtained by oxidation of the nitrite (27.3 mg. N), by reduction of the nitrate (28.5 mg. N) are sufficiently concordant with the

calcd. amt. of N (28 mg. N). Detns. made upon a soln. containing in 100 cc. 138 mg.  $\text{NaNO}_2$  = 28 mg. nitrite-N and 170 mg.  $\text{NaNO}_3$  = 28 mg. nitrate-N, show that the error in the detn. of the nitrite, or of the nitrate, is smaller than 1 mg. (calcd. for 100 cc. soln.). The error for the total-N detn. is a little higher, 1.3 mg. in one case. The weighed N quantities are found again up to 1.2 mg. for 100 cc. soln., thus 0.002%. This method is well adapted for following quant. the nitrification process, provided  $\text{FeSO}_4$  is absent. O. finds the influence of the presence of citric acid in the nitrite detn. to be very slight provided the addition of nitrite towards the end is very slow and the back titration is omitted.

TH. VERHEGGEN.

**Arsenite titrations of permanganate solutions.** ALOKE BOSE. *Chem. News* 117, 369-70(1918).—When permanganic acid, formed in steel solns. with  $\text{HNO}_3$ , is titrated with a standard soln. of  $\text{Na}_2\text{AsO}_3$  it is found that the factor obtained for Mn is about 1.5 times as much as the theoretical factor. It has been suggested that this is due to the reducing action of  $\text{HNO}_3$  either on the permanganate or arsenite, to the formation of manganic compds., or to the formation of a definite compd. either in the permanganate or arsenite. B. cites numerous expts. to prove that the cause is not attributable to any one of the three. Some other explanation is to be sought.

ERLE M. BILLINGS.

**Free acid determination in presence of metallic salts.** LOUIS F. CLARK. Potrerillos, Chile. *Eng. Mining J.* 106, 1066-8(1918).—Alc. is used to throw the metals out of soln. after adding neutral  $(\text{NH}_4)_2\text{SO}_4$  or a mixt. of 3 parts  $(\text{NH}_4)_2\text{SO}_4$  and 1 part anhyd.  $\text{Na}_2\text{SO}_4$  to form double salts with the metals. Cochineal is used as indicator and either alc. or aq. standard  $\text{NaOH}$  is used for titration. For *leach liquors* take 10 cc. sample, add about 4 g.  $(\text{NH}_4)_2\text{SO}_4$  and let stand till dissolved. Add 100 cc. EtOH (34-38° Bé.), agitate and allow to stand 20 min. If ppt. is not yet granular, add more  $(\text{NH}_4)_2\text{SO}_4$ . Add a dash of cochineal (made with 34° Bé. alc.) and agitate well while titrating. The alc. solns. may be filtered before titrating but a blank must be run to est. the loss of acid by mechanical retention in the ppt. Denatured alc. may be used for this work except for making up the standard alc.  $\text{NaOH}$  as the alkali decomposes the denaturant and the liquid becomes badly discolored.

J. E. CLARK.

**The identification of acids of agricultural products.** J. B. RATHER AND E. EMMETT REID. Arkansas Agr. Expt. Sta., *Bull.* 156, pp. 32(1918).—A study of the use of bromoacetophenone as a reagent in prepg. the phenacyl esters of acids both singly and in mixts. The method of prepg. this compd. and the details of prepn. and identification of the following esters are given: acetate, lactate, palmitate, stearate, succinate, glutarate, pyrotartrate, malate, tartrate, saccharate, maleate, fumarate, citraconate, itaconate, citrate, aconitate, benzoate, salicylate, *o*-, *m*-, and *p*-cresotate, mandelate, *o*-aminobenzoate, and cinnamate. The following acids have been sepd. and identified in the presence of each of the acids named: citric acid in the presence of tartaric, malic, benzoic, oxalic, acetic; succinic acid in the presence of tartaric, malic, citric, oxalic, fumaric, acetic, butyric; malic acid in the presence of tartaric, succinic, citric, oxalic, acetic; tartaric acid in the presence of succinic, malic, citric, benzoic, oxalic, acetic; stearic acid in the presence of palmitic, oleic, butyric; palmitic acid in the presence of stearic, oleic, butyric; benzoic acid in the presence of salicylic, acetic, tartaric, citric, oxalic, succinic; fumaric acid in the presence of maleic and succinic; and cinnamic acid in the presence of benzoic.

R. B. DEEMER.

**Determination of aldehyde sugars by means of iodine in alkaline medium.** H. COLIN AND O. LIEVIN. *Bull. soc. chim.* 23, 403-5(1918).—In studying the carbohydrate transformations in plant physiology it is often useful to know the ratio of glucose and fructose. Bougault has proposed a method based upon the fact that aldoses are oxid-



ized by iodine in alkaline solution while ketoses are not. In this method the plant extract is oxidized with iodine and the excess of iodine detd. The authors of this paper tried this method on plants rich in inulin. The results obtained were concordant with those obtained by the usual method of analysis based upon polariscopic readings and the reducing power of the tested soln.

J. K. DALE.

**Volumetric determination of reducing sugars.** A simplification of Scales' method for titrating the reduced copper without removing it from the residual copper solution. W. BLAIR CLARK. *J. Am. Chem. Soc.* 40, 1759-72 (1918).—The exact conditions are worked out and described for detg. reducing sugars volumetrically by a simplification of Scales' Method. A modified Benedict's alkaline copper soln. was used. The oxidation of the reducing sugars was carried out in the usual way; HCl was then added to distinct acidity after which a slight excess and known amt. of iodine soln. was added. The excess of iodine was then detd. by titration with  $\text{Na}_2\text{S}_2\text{O}_3$  using starch soln. as indicator. The difference between the  $\text{Na}_2\text{S}_2\text{O}_3$  used, and the amt. required by a blank test in which water instead of the substance under examn. is used with the copper soln., gives the  $\text{Na}_2\text{S}_2\text{O}_3$  equiv. of the iodine consumed in oxidizing the copper reduced by the sugar. The  $\text{Na}_2\text{S}_2\text{O}_3$  is standardized by a known quantity of invert sugar or dextrose and from this can be calcd. the amt. of invert sugar or dextrose equiv. to 1 cc. of  $\text{Na}_2\text{S}_2\text{O}_3$  and this factor can be used in calcg. results in unknown solns. The ratio of copper reduced in the citrate-carbonate soln. and hence also of the thiosulfate equiv. of the copper is very nearly proportional to the reducing sugar present. The effect of the time of heating upon the copper reduced is quite marked. Sucrose, alc., and the Crapek-Dox nutritive fluid have no appreciable reducing action on the copper-citrate carbonate soln., but 10% HCHO effects a small reduction.

J. K. DALE.

**New reaction for acetylcarbinol.** OSKAR BAUDISCH. *Biochem. Z.* 89, 279-80 (1918); *J. Chem. Soc.* 114, II, 412.—A dil. soln. of acetylcarbinol in  $\text{H}_2\text{O}$  containing NaOH is boiled for a few min. with  $o\text{-H}_2\text{NC}_6\text{H}_4\text{CHO}$ . The mixt. is then cooled, acidified, and made alk. again with  $\text{NaHCO}_3$ . A fluorescent soln. is obtained, from which 3-hydroxy-2-methylquinoline can be extd. by  $\text{Et}_2\text{O}$ ; on distg. off the  $\text{Et}_2\text{O}$ , it is obtained as a white residue, which gives a deep red color with alc.  $\text{FeCl}_3$ . The alc. soln. also gives a brilliant blue fluorescence on diln. with  $\text{H}_2\text{O}$ . These 2 reactions are characteristic.

C. J. WEST.

**Color reaction of aminoborneol.** J. TAKEEDA AND S. KURODA. *Yakugaku Zasshi (J. Pharm. Soc., Japan)* 441, 847-55 (1918).—Extending the reaction of  $\text{Cu}(\text{OH})_2$  toward amino alcohols to the  $\alpha$ - and  $\beta$ -aminoborneols and their alkyl derivs., the authors have observed that only the  $\beta$ -isomer or cis- form of aminoborneol or its *N*-mono-alkyl deriv. reacts with  $\text{Cu}(\text{OH})_2$  to form a red-violet complex salt of the formula  $(\text{R}'\text{CH}(\text{OH})\text{CH}(\text{NH}_2)\text{R}'')_2\text{CuO}$ . They considered this reaction as the characteristic of the  $\beta$ - or cis- form of amino alcohols.

S. KOMATSU.

The calculation of the position of minimum conductivity in neutralization (TREADWELL) 2. Gas bubbler for gas analysis (BURKE) 1. Mobility of gold in solid state (KELLER) 9. Treatment of crude ammonias (HUTIN) 18. Effect of "ground glass" on the gastro-intestinal tract of dogs (SIMMONS, GLAHN) 11A.

BOONE, WILLIAM T.: *A Complete Course of Volumetric Analysis*. London, Glasgow and Bombay: Blackie & Son, Ltd. 164 pp. 3s. 6d. For review see *Chem. News* 117, 389.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

**Chubutite, a new lead mineral.** HERCULES CORTI. *Anales soc. quim. Argentina* 6, 65-72 (1918).—This mineral (termed *chubutite* from the region of Chubut (Argentina) where it was observed) is yellow, with reddish tinge (sometimes greenish); the powder is canary yellow. The powdered mineral is practically insol. in  $H_2O$ , but readily sol. in dil.  $HNO_3$ ; it is less readily attacked by  $HCl$  and  $H_2SO_4$ , but dissolves in hot 30%  $KOH$  soln. When heated it turns dark maroon, and melts at a higher temp., giving a greenish residue. Its  $d. = 7.9520$  and hardness 2.5; it is brittle. When heated in  $H$  or illuminating gas it is reduced at a low temp. with formation of globules of  $Pb$ , a thin, brilliant layer of metallic  $Sb$ , and drops of acid  $H_2O$ . When fused on  $C$  it yields a metallic globule, with evolution of acid vapors. No  $Ag$ ,  $Au$  and  $Pt$  nor basic element pptd. by  $(NH_4)_2S$  or by carbonates of  $NH_4$  or alkali metals could be detected. The mineral had the following compn.:  $SiO_2$  0.76%,  $Al_2O_3$  0.12%,  $Fe_2O_3$  0.19%,  $Sb_2O_3$  0.69%,  $PbO$  83.30%,  $PbCl_2$  14.83%,  $As$  traces, undetd. 0.11%. Disregarding  $SiO_2$ ,  $Al_2O_3$ ,  $Fe_2O_3$  and  $Sb_2O_3$ , the formula is  $7PbO.PbCl_2$ . The absence of  $Ag$  may be explained on the supposition that the mineral was originally produced in a slightly reducing medium, and small amts. of metallic  $Pb$ , having a greater  $d.$  than the molten mineral, settled out, removing with it any  $Ag$  originally present. This supposition is supported by fusing in a slightly reducing medium (Perrot furnace) a mixt. of comm. litharge (containing a small amt. of  $Ag$ ) and  $PbCl_2$  in the same proportion found in natural chubutite. A cryst. mass similar to the mineral was obtained; the free  $Pb$  contained all the  $Ag$  originally present, while the oxychloride was entirely free from  $Ag$ . In a slightly oxidizing medium no free  $Pb$  was obtained. Micrographic examn. showed the mineral to be composed of thin laminas of variable transparency, greenish yellow and non-pleochroic; the value of  $n$  was not high, and the birefringence slight. The mineral probably belongs to the tetragonal system.  $C.$  enters into a description of other  $Pb$  minerals which have the same qual. compn. as chubutite and compares them with the latter. Cf. Lorettoite; Wells and Larsen, *C. A.* 11, 131. H. S. PAINE.

**Chemical study of a titanium mineral from the Sierra del Pié de Palo (San Juan).** LUCIANO R. CATALANO. *Anales soc. quim. Argentina* 6, 35-48, 83-93 (1918).—This mineral consists of 3 distinct mineralogical species which may be readily sepd. by color and hardness; 2 of these are talc and calcite, and the 3rd has the following physical properties: metallic or submetallic luster; streak black;  $H. > 6$ ;  $d. = 4.69$ . It can be heated to  $180^\circ$  without apparent change in compn., but at red heat the color changes somewhat and the wt. increases, owing to oxidation. The mineral is anhydrous and also yields no gases when heated. Cold concd.  $HCl$  dissolves it almost completely. Treatment with hot  $HCl$  results in a soln. containing a whitish ppt. insol. in excess of  $HCl$ . Soln. in  $HNO_3$  is slow; aqua regia acts slowly and not as completely as  $HCl$ ;  $H_2SO_4$  only attacks the mineral when hot and then only slowly. Fusion with  $Na_2CO_3$ ,  $NaOH$ , or  $Na_2O_2$  causes complete decompn.; the fused mass is sol. in  $H_2O$  with a reddish residue of  $Fe$  oxide and  $Na$  metatitanate. This residue is sol. in  $HCl$ , leaving a residue of  $Ti$  oxide. Fusion with  $KHSO_4$  or  $NaHSO_4$  causes complete decompn. and yields a mass completely sol. in dil.  $H_2SO_4$ . This aq. soln. is hydrolyzed when heated,  $Ti$  oxide being formed. The mineral was fused with  $PbCO_3$ , the temp. being gradually raised to redness. Tests with the fused mass failed to show the presence of  $SiO_2$ ,  $K$  and  $Na$ . Analysis showed:  $FeO$  45.35,  $TiO_2$  25.40, and  $MnO$  1.84%, corresponding to  $(Fe, Mn)TiO_3$ . The mineral is thus a new variety of ilmenite. H. S. PAINE.

**The probable identity of peganite with variscite.** LORENZO MOSCHETTI. Univ. Torino. *Atti reale accad. sci. Torino* 53, 1062-6 (1917-8).—A cryst. hydrous  $Al$  phosphate

from Saxony was named peganite by Breithaupt in 1830 on the basis of an analysis showing  $\text{Al}_2\text{O}_3$  44.49,  $\text{P}_2\text{O}_5$  31.25, and  $\text{H}_2\text{O}$  22.82, corresponding to  $2\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 6\text{H}_2\text{O}$ . Crystallographically, in so far as it was measurable, it was identical with wavellite, but it is usually classed by mineralogists as a definite species. In the course of time material from other localities was assigned to the same species, although some from Arkansas was subsequently shown to be variscite, and that from Portugal agrees, as shown by 2 analyses in the literature, much more closely with wavellite than with the original peganite. The  $\text{H}_2\text{O}$  content seems low for wavellite, but this mineral loses over 2% of  $\text{H}_2\text{O}$  below  $100^\circ$ , which may well account for this. A specimen of peganite from the type locality agreeing in properties with that described by Breithaupt, was analyzed, and gave:  $\text{CaO}$  0.65,  $\text{Al}_2\text{O}_3$  31.63,  $\text{Fe}_2\text{O}_3$ ,  $\text{MnO}$  traces,  $\text{P}_2\text{O}_5$  44.99,  $\text{H}_2\text{O}$  23.20. insol. 0.01, sum 100.48%. This corresponds exactly with  $\text{AlPO}_4 \cdot 2\text{H}_2\text{O}$ , which is the formula of variscite [also of lucinite—ABSTR.]. It agrees moreover with variscite in its insol. in b.  $\text{HCl}$ ; and in becoming lilac to bluish lavender on heating to  $120$ – $150^\circ$ ; and in its sp. gr., which is 2.56–2.57, or according to Breithaupt 2.492–2.496, while variscite from Utah has 2.54 and that from Voigtland 2.41. It is suggested that Breithaupt may have got his figures for  $\text{Al}_2\text{O}_3$  and  $\text{P}_2\text{O}_5$  transposed, in which case his analysis would be essentially identical with the present one. And it is concluded that the evidence that peganite exists as a species apart from variscite is inadequate, so the former name should be withdrawn from mineralogic literature. [The question could be more satisfactorily settled had Breithaupt or M. furnished even the simplest optical data.—ABSTR.] E. T. W.

**Factors influencing gold deposition in the Bendigo Goldfield.** F. L. STILLWELL. *Bull. Commonwealth of Australia, Advisory Council of Sci. and Ind.* 1917, No. 4, 68 pp. —A more detailed account of the region previously described (C. A. 12, 1277).

S. G. GORDON.

**The alunite deposits of Australia and their utilization.** FRANK W. JAMES. *Bull. Commonwealth Australia, Advisory Council Sci. and Ind.* 1917, No. 3, 38 pp.—Alunite occurs at Carricklinga, S. Australia, as nodular masses in decomposed slate or pug, lying in a continuous vein along the bedding planes of the slate; at Warnertown, S. Aus.; and at Bullahdelah, N. S. W., where the high grade ore occurs only in patches or enrichments in a main body of low-grade alunite. The ore produced has been shipped to England for the production of alum and Al sulfate. Heat treatment showed that: at  $500^\circ$  the alunite loses its  $\text{H}_2\text{O}$  of constitution and is converted into K-Al-sulfate and alumina; at  $600^\circ$  a slight decompn. of the former takes place; at  $700^\circ$ ,  $\text{SO}_2$  is freely evolved; at  $800^\circ$  the decompn. is rapid and complete, the action being finished in an hour. The expts. showed the necessity of thorough rabbling and quick removal of the  $\text{SO}_2$  to effect a speedy and thorough roast on a large scale. The  $\text{SO}_2$  is partly dissociated into  $\text{SO}_2$  and  $\text{O}_2$ , and if it is desired to recover the  $\text{SO}_2$  as sulfuric acid, a muffle type furnace for calcination and a complete sulfuric acid plant would be necessary. A number of expts. for the treatment of alunite to produce  $\text{K}_2\text{SO}_4$  were made, and the following steps are recommended: Crush the ore to about  $\frac{1}{4}$  inch mesh; roast in a suitable furnace alone, or preferably with molasses or sawdust till all sol. alumina is absent; grind roasted ore to pass 40-mesh sieve; treat the residue with boiling water and digest; filter-press the pulp and wash with hot water; evap. the soln. to obtain the  $\text{K}_2\text{SO}_4$ . Notes are given for a working plant, and cost of treatment. Detailed results of exptl. work, analyses, a bibliography, and patent specifications are given.

S. G. GORDON.

**An interpretation of the so-called paraffin dirt of the Gulf Coast fields.** ALBERT D. BROKAW. *Bull. Am. Inst. Mining Eng.* 1918, 1674–7; 1919, 98–101; cf. C. A. 12, 1035, 1960.—Discussion of a paper on the above subject. J. H. B.

**A form of multiple rock diagrams.** FRANK F. GROUT. *J. Geology* 26, 622-5 (1918).—Instead of using the chem. analysis directly, which gives a conspicuous line for  $\text{SiO}_2$ , the analyses are recalcd. to norms, in which a larger number of constituents are present. The mode may be substituted for the norm if preferred. These diagrams are clamped into position, permitting rearrangement as they are studied from different points of view.

WALTER F. HUNT.

**A type of igneous differentiation.** FRANK F. GROUT. *J. Geology* 26, 626-58 (1918).—The rocks of the Duluth gabbro fall into two series, one related to the gabbro family, the other to the granite family. Intermediate types are rare. The rocks of the gabbro series are normal gabbro, olivine gabbro, troctolite, peridotite, magnetite gabbro and anorthosite. The line of contact between the gabbro and granite is sharp and without alternation, indicating that the processes involved in the sepn. of granite and gabbro were probably of a different type than those which produced the various phases in the gabbro itself. The various modifications of the gabbro series probably resulted from a differentiation by crystn. during convection, aided by sinking of the crystals. Before solidification was complete the granitic magma sepd. from the gabbro by some other process, and both field and lab. studies suggest a sepn. of an immiscible liquid. Thus evidence is at hand that differentiation of two types may occur in the same magma chamber.

WALTER F. HUNT.

**Titanium-bearing corundum spinellite (rock emery).** THOMAS L. WATSON AND GEORGE STEIGER. *J. Wash. Acad. Sci.* 8, 665-76 (1918).—Vein-like masses or lenses of rock emery up to 6 feet across occur in granite aplite-pegmatite and mica schist near Whittles, Pittsylvania Co., Va., in a region of cryst. rocks. The ore bodies are genetically related to the granite aplite-pegmatite, bodies in the schist occurring near the schist-granite contact and conforming closely with the lamination of the schists. Marked contact effects are shown in places in the schist, with the development of sillimanite, spinel, magnetite, and corundum. The rock emery is a heavy, black, tough, fine-grained cryst. aggregate, somewhat magnetic from the presence of magnetite. Rarely corundum crystals measuring sometimes  $2.5 \times 1$  cm. are developed in the schist. Microscopic study of the ore shows it to consist of green, or sometimes brown, spinel (pleonaste), magnetite, and corundum, with some ilmenite, and an unknown weathering product, a nonpleochroic, isotropic, reddish brown mineral, occurring as distinct rims around the spinel. An analysis of the granite aplite-pegmatite is given. Analysis of spinel by S. gave:  $\text{Al}_2\text{O}_3$  53.52,  $\text{Fe}_2\text{O}_3$  10.35,  $\text{FeO}$  24.53,  $\text{MgO}$  10.02,  $\text{SiO}_2$  0.92,  $\text{TiO}_2$  0.67, sum 100.00%. Rock emery, S.:  $\text{SiO}_2$  2.53,  $\text{Al}_2\text{O}_3$  45.38,  $\text{Fe}_2\text{O}_3$  23.33,  $\text{FeO}$  17.90,  $\text{MgO}$  5.71,  $\text{CaO}$  0.06,  $\text{Na}_2\text{O}$  0.20,  $\text{K}_2\text{O}$  none,  $\text{H}_2\text{O} +$  0.33,  $\text{H}_2\text{O} -$  0.99,  $\text{TiO}_2$  3.72,  $\text{ZrO}_2$  none,  $\text{CO}_2$  0.07,  $\text{P}_2\text{O}_5$  none,  $\text{SO}_2$  none, S none,  $\text{Cr}_2\text{O}_3$  0.05,  $\text{NiO}$  0.04,  $\text{MnO}$  0.15,  $\text{BaO}$  none,  $\text{SrO}$  none, sum 100.46%; sp. gr. 4.152 (av. of 5 detns.).

S. G. GORDON.

**Composition of Miocene conglomerates of the French subalpine ranges.** PIERRE TERNIER AND WILFRID KILIAN. *Compt. rend.* 167, 584-8 (1918).—A petrographic study of 36 samples of these conglomerates is given and the findings are discussed with reference to the origin of the formations.

L. W. RIGGS.

**Oölites and spherulites.** WALTER H. BUCHER. *J. Geology* 26, 593-609 (1918).—H. Schade was the first to show experimentally that concretionary bodies are formed when a substance passes from an emulsion colloid to a solid. The spherical shape of the grains is due to the tendency of the droplets to coalesce. If the change leads to the cryst. state the resulting structure is radial (spherulitic) if the substance is pure, but if other substances are pptd. along with it a concentric (oölitic) structure is developed. Confirmatory observations were obtained with Fe chloride. It is believed

that the same principles underlie the formation of most sedimentary oölites, spherulites and concretions, for almost all substances which are known in one of these forms are also known to occur extensively in nature in the colloidal state. A review of the natural oölites emphasizes this relationship.

WALTER F. HUNT.

**Rhythmic banding of manganese dioxide in rhyolite tuff.** W. A. TARR. *J. Geology* 26, 610-7(1918).—A rhyolite tuff near Tucson, Arizona, contains circular or elliptical stains of  $MnO_2$ , reaching a max. size of 30 mm. The amt. of  $MnO_2$  is small (0.82%) and the areas are banded in character. Two suggestions are advanced to explain their formation: The Mn was either derived from the surrounding tuff and aggregated into the banded form, pptn. being due to oxidation; or the  $MnO_2$  was derived from some mineral located at the nucleus and pptd. in successive rings following the mingling of the outwardly moving soln. with one of oxidizing character. The second view is believed to be the more probable.

WALTER F. HUNT.

**The origin and the age of laterite from the standpoint of recent soil research.** E. BLANCK. *Petermanns Mit.* 63, 233(1917); *Biedermanns Zentr.* 47, 197-8(1918).—The deductions of J. Walther (*Petermanns Mit.* 62, 1(1916), *Biedermanns Zentr.* 46, 385(1917)) concerning laterite are criticized. Laterite cannot be considered as having been exclusively formed in previous ages.

ALBERT R. MERZ.

**Origin of serpentine, a historical and comparative study.** W. N. BENSON. Univ. Otago, N. Z. *Am. J. Sci.* 46, 693-729(1918).—The evidence presented with reference to the large ultra basic masses, "supports the view that the chrysotile or antigorite-serpentine of which they are composed is an alteration product of an originally intrusive peridotite, often more or less pyroxenic, and that in some cases at least the hydration was brought about by the agency of waters emanating from the same magma that produced the peridotite, though not generally until a considerable amt. of further differentiation had taken place." The change was, however, completed by the end of one orogenic period of vulcanicity. In short, "much of the serpentinization is performed by water of magmatic origin."

L. W. RIGGS.

Investigation of clay and shale resources of Canada (KEELE) 19. Investigation of peat bogs (ANREP) 15. Isomorphous mixtures (GAUBERT) 2. The Canadian graphite industry (SPENCE) 18.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

**Colloids and flotation.** F. G. MOSES. U. S. Bur. Mines, *Tech. Paper* 200, 22 pp.(1918).—This paper shows the application of certain facts of colloidal chemistry and physics to practical flotation operations. The subject is discussed under the general captions: sulfides not wetted by  $H_2O$ ; colloids and adsorption; adsorption and equil.; action of colloids; condition of flotation oils; different types of colloids; benefit from removing colloids; effect of size of sulfide particles; possible application of theories in practice. Many practical examples are cited.

F. W. SMITHER.

**Differential flotation of lead and zinc sulfides.** A. DEL MAR. *Mining Sci. Press* 117, 691-3(1918).—A general discussion based on the author's experience. A flow-sheet is given for mixed gravity and flotation treatment. Of the different reagents for the sepn. of galena from blende, and then concentrating the remaining Zn, in the order of their usefulness for sepg. the Pb the author places eucalyptus oil first, particularly with an acid pulp; next cresylic acid; then hardwood creosote; and last pine-tar oils.

F. W. SMITHER.

**The development of galena flotation at the Central Mine, Broken Hill.** R. J. HARVEY. *Bull. Inst. Mining Met.*, No. 170, 17 pp.(1918).—The object of this paper is to trace the steps by which flotation has superseded gravity concn. at the Central Mine. The ore is a complex Ag-Pb-Zn sulfide associated in the main with quartz, rhodonite, rhodocrosite and some garnet sandstone. It contains about 11 oz. Ag, 14% Pb, 15% Zn. Crushing to 40 mesh is necessary to obtain complete freeing of the mineral particles from the matrix and from each other. The exptl. work is described in detail with tables of results, flow sheets, drawings, etc. The latest galena flotation plant, which has ousted the Card tables previously in use, is called "lead cascades." In this plant there are no moving parts and no use of compressed air. It consists of a series of boxes set one above the other, the pulp in descending from box to box passing through nozzles, thereby drawing into itself the air necessary for flotation. The concentrates overflow the lip of each box and the tailings pass on to the next in series. This plant has been a complete success, the recovery of the Pb and Ag being greater than with Card tables. The galena which escapes the Cascades, if fine, is caught by the galena flotation boxes in the Zn plant; if coarse, it is removed from the Zn concentrates by the Wilfley tables in the de-leading plant. About 2 oz. per ton of a mixt. of coal tar and eucalyptus is added to the pulp as flotation medium. Effective recovery: Pb, 85.6%; Ag, 64.4%; Zn, 83.3%; recovery prior to the introduction of galena or "selective" flotation (same sequence): 77.6, 49.2, 85.8%. The substitution of flotation for gravity concn. has meant the discarding of: 20 Card tables, 4 Wilfley tables and 16 Weir-Meredith vanners in the Pb mill and 14 W.-M. vanners in the de-leading plant, with the necessary attendants and maintenance. Screen analyses of jig Pb concentrates, Card table Pb concentrates and Cascade Pb concentrates are appended.

F. W. SMITHER.

**Glew mill test. Elutriation of the crushed products.** S. J. TRUSCOTT. *Bull. Inst. Mining Met.* 164, 6 pp.(1918).—The crushed products examd. were: the battery feed and the final tailing; the tubemill feed and its discharge; and the concentrate sold. The velocities used in making the analyses, together with the approx. sizes of the quartz and cassiterite particles lifted by these velocities, are given in a table. Tables are also given showing the results of the elutriation grading analyses. Grinding reduced 8% of the tube mill to —1200 mesh. With the battery feed the bulk of the Sn is contained in the coarser sizes, the contents regularly decreasing down to the finest material. The intermediate sandy material gave the highest assays. With respect to the tailing analysis, free cassiterite will no longer exist in the coarsest size. The tube mill figures further indicate that the fine material in the tube mill feed, by reason of unavoidable imperfections in classification, is rich, and that cassiterite does not suffer any undue comminution in regrinding. The figures of the concentrate sold show that, in spite of the calcination, more than  $\frac{2}{3}$  is larger than 300 mesh, and close upon 50% is larger than 200 mesh.

F. W. SMITHER.

**Recovery and losses of tin at Glew Mill.** R. A. THOMAS, *et al.* *Bull. Inst. Mining Met.* 164, 11 pp.(1918).—Report of a sub-committee of the "Tin and Tungsten Research Committee" appointed to investigate the methods of Cornish Sn dressing. The methods followed are reported in detail with analytical and other data, flow sheet of the Glew Mill, etc. The loss found by actual expt. was 35.5%, the theoretical calcd. loss being 35.9%. The ore had the following compn.: loss on ignition, 0.17; As, 0.045; Pb, 0.032; Cu, 0.15; SnO<sub>2</sub>, 1.4; Fe<sub>2</sub>O<sub>3</sub>, 5.2; Al<sub>2</sub>O<sub>3</sub>, 33.88; alkalis, 0.9; CaO, 0.4; MgO, 0.12; SiO<sub>2</sub>, 56.0%. The mean result of vanning assays calcd. from the metallic Sn found by chem. analysis gave a recovery of 65.4%.

F. W. SMITHER.

**Effect of heating and heating and quenching Cornish tin ores before crushing.** A. YATES. *Bull. Inst. Mining Met.* 170, 3 pp.(1918).—An exptl. study reported

in detail. All the tests show that the effect of heating, and still more of heating and quenching, is to make the ore much easier to crush, yielding a crushed product with a greater proportion of middle-sized particles, and a smaller proportion of that fine slime from which very little Sn can be recovered. Seven concn. tests were made between raw, heated, and heated and quenched samples of crushed lump ore, on a Wilfley table; of these 6 did not show any improvement in recovery as a result of the heating. The very fine slime, both from raw and from heated ore, proved in all cases to be much poorer than the av. of the whole lot treated. F. W. SMITHER.

**A dry concentration plant in Arkansas.** T. SHIRAS. *Eng. Mining J.* 106, 909-10 (1918).—A detailed description of a dry-concn. plant to be operated as a custom concentrator in the north Arkansas Zn and Pb district. F. W. SMITHER.

**The Utah copper enterprize. VII. Flotation practice.** T. A. RICKARD. *Mining Sci. Press*, 117, 749-53 (1918).—A detailed description of the operations in the Arthur mill of the Utah Copper Co. A four-page drawing of the mill, in plan and section, accompanies the article. **VIII. The leaching plant.** *Ibid* 787-91.—This installment gives a detailed description, with illustrations, drawings, screen analyses, etc., of the plant for treating the oxidized Cu ore (av. about 0.65% Cu) of the Utah Cu mine at Bingham. The Cu is dissolved by  $H_2SO_4$  derived from the decomn. of sulfide mineral and is pptd. upon scrap Fe. The plant has a capacity of 2,000 tons of ore per day. F. W. SMITHER.

**The condensation of zinc from its vapor.** C. H. FULTON. *Bull. Am. Inst. Mining Eng.* 1918, 1649-51.—A critical discussion by E. E. Thum of a paper by F. Cf. C. A. 12, 1868. F. W. SMITHER.

**The condensation of zinc from its vapor.** C. H. FULTON. *Bull. Am. Inst. Mining Eng.* 1919, 109-10.—The author's reply to a discussion by E. E. Thum (preceding abstract). F. W. SMITHER.

**The effect of oxygen upon the precipitation of metals from cyanide solutions.** T. B. CROWE. *Bull. Am. Inst. Mining Eng.* 1918, 1667-8.—Discussion by Clevenger, *et al.* of a paper by Crowe (cf. C. A. 12, 2183). G. T. Hansen states that heating accomplishes practically the same result, as regards removal of air, as applying a vacuum. F. W. SMITHER.

**The effect of oxygen upon the precipitation of metals from cyanide solutions.** T. B. CROWE. *Bull. Am. Inst. Mining Eng.* 1919, 107-9.—Discussion by L. D. Mills of a paper by Crowe (preceding abstract). At the Belmont mill in Tonopah the saving in chemicals alone by the Crowe vacuum process exceeds \$0.15 per ton of ore milled. F. W. SMITHER.

**Roasting for amalgamating and cyaniding Cripple Creek sulfotelluride gold ores.** A. L. BLOMFIELD AND M. J. TROTT. *Bull. Am. Inst. Mining Eng.* 1918, 1668-9.—Discussion by J. M. Tippet of a paper by B. and T. Cf. C. A. 12, 2183. F. W. S.

**Refining gold bullion with chlorine gas and air.** R. R. KAHAN. *Bull. Inst. Mining Met.* 170, 4 pp. (1918).—A modification of Miller's Cl process by combining it with T. K. Rose's method for toughening Au bullion by means of O, gas or air. (The word "refining" is used to denote the removal of Ag and base metals from Au bullion; "toughening" to denote the removal of impurities which make Au bullion brittle.) The author discusses the losses of gold that occur in the Cl process, the major portion being in the final stages. Any improvement in Miller's process must be in the direction of removing the last traces of base metals while there is still a considerable amt. of Ag present in the bullion. Various methods were tried to attain this object, the most successful being as follows: Introduce 2 clay pipe stems into the refining crucible; connect one to an air compressor delivering air at a pressure of 6 or 7 lbs. per sq. in.,

and the other to the Cl generator. At the beginning of the refining operation the max. amt. of air is used, so much as will just avoid the globules of metal being projected through the borax cover, and a very slow stream of Cl. As the operation progresses the vol. of air used is diminished, and that of the Cl is increased, until finally, the air pipe is removed and Cl alone is used. The principle governing the regulation of the air and the Cl is that fumes should be prevented from leaving the borax cover; if the fumes become too voluminous more air must be used and less Cl. It is advantageous to mix the brittle bullion with the most silvery bullion available. It is frequently beneficial to remove the borax cover, and replace it with another cover of fresh borax.

F. W. SMITHER.

**Two instances of mobility of gold in solid state.** E. KELLER. *Bull. Am. Inst. Mining Eng.* 1919, 33-42.—An exptl. study reported in detail. Oxidation tests of auriferous converter Cu (99.29%) and leaded Cu (95.65%) plates show that the Ag is practically immobile. At no stage of the oxidation was all the Au taken up by the oxide scales while some must have retreated and concd. on, or in, the residual plate. The first layer of oxide, or scales, formed in the quenching of cast Cu contains only about  $\frac{1}{10}$  of the Au in the original Cu. A table is given showing the greater speed of oxidation of Cu containing impurities as compared with that of the purer converter Cu. With decreasing Au content in the Ag-Au bead the more marked will be the Au movement in the direction of the retreating surface of the Ag under the solvent action of the  $\text{HNO}_3$ . The bearing of this on the accuracy of the Au assay, and the influence of impurities in Ag on Au mobility are discussed in some detail with a table giving assays of Cu anode residues.

F. W. SMITHER.

**Smelting cyanide silver-precipitate in oil-burning reverberatory furnaces.** K. A. CUNNINGHAM AND A. FEUST. *Mining Sci. Press* 117, 621-4(1918).—A detailed description, with drawings of the furnace, of a method devised to overcome the difficulty caused by the shortage of graphite crucibles in Mexico. Tables are given showing final clean-up, analysis of ppt., consumption of fluxes, in the crucible and reverberatory processes, and the analyses of the 2 types of slag.

F. W. SMITHER.

**Quicksilver operations at Monte Amiata, Italy.** R. STERNER-RAINER. *Chem. Met. Eng.* 19, 770-5(1918).—An account of the development of the Italian deposits of cinnabar beginning with the early developments. The most important operations (described with illustrations) at present are at Abbadia San Salvatore and Siele.

F. W. SMITHER.

**Mercury production at Almaden, Spain.** ROLAND STERNER-RAINER. *Chem. Met. Eng.* 20, 32-5(1919).—"The economic conditions of the Spanish Hg industry are taken up, as well as legal conditions, including markets and the Rothschild contracts. The metallurgical operations of sorting and sampling the ore, the Bustamente and Cermak furnaces and condensers are described briefly."

F. W. SMITHER.

**Phases of iron and steel metallurgy in 1918.** JOHN HOWE HALL. *Iron Age* 103, 27-8(1919).—The subjects reviewed are defects in ingots and their remedies, the Mn problem, autogenous welding, elec. steel, high-grade steel castings, cast steel chain, heat-treated steel castings, oil-burning cupolas, alloy steel helmets.

E. H.

**The principles of open-hearth design.** CHARLES H. F. BAGLEY. *Iron and Steel Inst.*, Sept. 13, 1918; *Engineering* 106, 400-3.—A keen interest is being taken in England in the subject of open-hearth design with the object of raising British practice up to or above the standards of Continental and American practice. B. discusses in a general manner the salient features of correct design. No particularly new facts are presented, many of the suggested improvements being already common practice in the U. S. The article is not such as to permit of brief abstracting. A number of diagrams are shown.

A. L. FIELD.



**Waste heat for steam generation.** THOMAS B. MACKENZIE. *Iron and Steel Inst.*, Sept. 13, 1918; *Engineering* 106, 567-9, 597-9.—A detailed account of the performance of boilers utilizing the heat of the waste gases from open-hearth furnaces. It was found by trial that an induced draft fan, placed beyond the boiler, was necessary to prevent the cooling effect of the heating surface from reducing the draft to too great a degree. The first successful installation consisted of a Babcock and Wilcox water-tube boiler, 1,619 sq. ft. heating surface, in series with an economizer having a heating surface of 720 sq. ft., operated on the waste gases from a 30-ton acid open-hearth furnace. The fan had an impeller 20 in. diam., driven by a variable-speed d. c. motor of 20 brake h. p. The amt. of steam generated was 1,084 lbs., at 101 lbs. pressure with a dryness factor of 0.95 per ton of steel ingots. The efficiencies were: boiler 35.55%, economizer 14.48%, over all 37.80%. The equivalent amt. of elec. energy would be sufficient to roll the steel produced. In later installations, B. and W. boilers, 1,827 sq. ft. heating surface, and economizers of 960 sq. ft. surface were used on 45-ton open-hearth furnaces. The impeller fan was 30 in. diam., driven by a 40 h. p. motor. The amt. of steam generated was 949.3 lbs. per ton of ingots, at 119 lbs. pressure and dryness factor of 0.95. The efficiencies were: boiler 45.83%, economizer 21.25%, over all 49.91%. The electrical equiv. of the energy amounted to 54.2 kw. hrs. per ton of ingots; and the fuel equiv. to 583.2 lbs. coal, of 6,700 cal., per hr. per furnace, assuming an ordinary boiler efficiency of 65%. The fans discharge directly through short funnels into the atm. The furnace chimneys have disk-plate dampers on top, which are kept nearly closed when the boiler, etc., are in operation. The chimney is not entirely closed to prevent possible accumulation of explosive mixt. In the last mentioned installation, the following av. temps. were observed: temp. gases entering boiler, 422.1°; gases entering economizer, 232.4°; gases entering fan, 184.4°; temp. feed water entering economizer, 40.8°; feed entering boiler, 133.5°. The water evapd. from and at 100° per sq. ft. heating surface was 1.84 lbs. per hr. The waste gases entering the boiler, when calcd. to a wet basis, had the following av. compn.: CO<sub>2</sub> 11.27, H<sub>2</sub>O 6.88, N<sub>2</sub> 49.96, excess air 31.89.

A. L. FEILD.

**Gas-fired furnaces for brass melting.** A. FORSHAW. *Foundry* 47, 37-8(1919).—A review and discussion of British practice. Coke-fired tilting furnaces are close competitors of gas-fired furnaces, as they are claimed to have an efficiency of 15%. The author is of the opinion that too much attention is given to the consumption of fuel and too little to other factors that enter into the melting of metals. Gas-fired and coke-fired furnaces are compared as to costs, operation, damage to linings, etc.

F. W. SMITHER.

**Use of oil fuel in the foundry in urgent exceptional circumstances.** A. E. PLANT. *Inst. of Metals* (advance copy), Sept. 11, 1918, 5 pp.—A brief account of work done by the British Expeditionary Forces in field repair shops in producing new parts from scrap and waste material on the spot. The chief points in favor of using oil fuel under the conditions obtaining are: "(1) It is only necessary to have the furnace in operation about 1/4 hr. before the crucible and charge are introduced. (2) The furnace can be put in and out of operation very quickly. (3) Temp. control is easy and consistent. (4) Saving in transport of solid fuel. (5) Utilizing waste oil on the spot. (6) In the case of the "Charlier furnace," borings and scrap can be melted more easily and economically than could be done in crucibles." The waste oil cannot be used again for lubricating purposes without refining, owing to the fact that it contains quantities of finely divided C, mud, and other impurities.

F. W. SMITHER.

**Automatic copper plating.** J. W. RICHARDS. *Bull. Am. Inst. Mining Eng.* 1919, 27-31.—A description, with illustrations of the machines, of the process used by The Metals Plating Co., at Elizabeth, N. J., for the Cu plating of Fe sheets. "The

plating metal is applied to the sheet in the form of a liquid mixt. by means of rolls, such as inking rolls. The sheet, after being coated with the mixt., is automatically carried forward and deposited on a link-belt conveyor, which carries it through a furnace maintained at a temp. well above that of molten Cu. The basic principle involved in this method lies in the application of the plating metal to the sheet while the sheet is cold and then melting the metal in place on the sheet under conditions which are favorable to the formation of the plating. The liquid plating mixt. is composed of either CuO or finely divided Cu, or a mixt. of both, ground to the consistency of a light varnish in a crude oil having an asphaltic base, of a d. of from 14° to 16° Bé."

F. W. SMITHER.

**The metallurgy of the arc weld.** W. E. RUDER. *Gen. Elec. Rev.* 21, 941-6(1918).—The making of a good weld is essentially a metallurgical problem. The factors influencing the quality of a weld are briefly discussed. Photomicrographs show the structure of welds under different conditions. N introduced by the combination of N with Fe vapor either directly or through the formation and decompn. of oxides of N, is believed to be the chief source of brittleness. The needle-like structure usually associated with N-bearing steels is shown to be only one phase of the N-Fe combination, and is frequently masked by rapid cooling or the presence of carbon. In the absence of accurate knowledge of their exact nature, these lines are termed N-lines rather than nitride lines. N or possibly  $Fe_3N_2$  appears to form a solid soln. with Fe. There is some evidence that C also may enter into this solid soln.

W. E. RUDER.

**Notes on regulations for arc welding.** H. M. SAYERS. *Electrician* 81, 715-7 (1918).—This paper deals chiefly with the necessary precautions during welding operations, protection of the eyes, protection from shock, etc.

C. G. F.

**Lloyd's experiments on electrically welded joints.** H. JASPER COX. *Gen. Elec. Rev.* 21, 864-70(1918).—After briefly referring to the functions of Classification Societies, C. describes the test made upon arc welded joints to det. the acceptability of that type of joint in ship construction. The requirements of Lloyd's are set forth and the testing machines employed together with the method of performing the test are described. The summary of the results of modulus of elasticity, ultimate strength and alternating stress tests show conclusively the reliance which can be placed in this type of joint.

W. E. RUDER.

**Microstructure of iron deposited by electric arc welding.** GEORGE F. COMSTOCK. *Bull. Am. Inst. Mining Eng.* 1919, 43-50.—Conflicting opinions have been expressed concerning the identity of the needles or small crystals present in oxyacetylene and electric welds. The results here described were obtained in the microscopic examination of etched specimens of an electric weld; photomicrographs of the structure are shown. The needles or pale crystals, which are typical of steel fusion, may occur very abundantly in iron containing only 0.04% C and when annealed thoroughly and slowly cooled, the needles will diffuse into the steel from the welded metal but do not merge with the pearlite of the steel. From this fact, the conclusion is drawn that the crystals are probably those of iron nitride. Boiling in Na picrate etching fluid will not serve to differentiate between nitride and carbide or sulfide in a polished specimen of steel.

W. T. H.

**Development of grain boundaries in heat-treated alloy steels.** R. S. ARCHER. *Bull. Am. Inst. Mining Eng.* 1919, 51-5.—In the microscopic examination of air-craft engine parts, the usual etching media do not disclose any but gross defects in heat treatment. Photomicrographs are shown which were obtained after etching for from 5 to 25 min. in a 4% soln. of picric acid in alc. and then rubbing off the carbonaceous smudge on moist broadcloth or kersey. With this etching agent, the grain bounda-

ries of Cr-Ni and of Cr-V steels hardened to about 300° Brinell are brought out clearly.

W. T. H.

**Volatility of the constituents of brass.** JOHN JOHNSTON. *Bull. Am. Inst. Mining Eng.* 1919, 96-7.—Discussion of paper abstracted in *C. A.* 12, 1758. J. W. Richards pointed out the need of vapor-tension curves and heats of combination in the study of brass.

W. T. H.

**Pure carbon-free manganese and manganese-copper.** ARTHUR F. BRAID. *Bull. Am. Inst. Mining Eng.* 1919, 97.—A brief discussion of the use of Mn and Mn-Cu in the manufacture of non-ferrous alloys. Cf. *C. A.* 13, 222.

W. T. H.

**The constitution of the tin bronzes.** SAMUEL L. HOYT. *Bull. Am. Inst. Mining Eng.* 1919, 101-2; cf. *C. A.* 13, 225.—A brief discussion of the paper.

W. T. H.

**The action of reducing gases on hot solid copper.** NORMAN B. PILLING. *Bull. Am. Inst. Mining Eng.* 1919, 103-7; cf. *C. A.* 12, 2532.—In the discussion of this paper, W. H. Bassett pointed out that the effect of H on Cu has been known for some time as evidenced by a popular article written by Heyn in 1904. B. disagrees with P. regarding some of the theoretical points.

W. T. H.

**A comparison of grain size measurement and Brinell hardness of cartridge brass.** W. H. BASSETT AND C. H. DAVIS. *Bull. Am. Inst. Mining Eng.* 1919, 79-81.—The purpose of this investigation was to det. the grain size of cartridge brass, its relation to Brinell hardness and to collect data for the aid of those concerned in the inspection of such brass. Two alloys were studied. The first was taken from regular mill stock that had been rolled from 14.7 mm. to 9.5 mm. gage, corresponding to a reduction of 35.1%. It contained 69.2% Cu, 30.76% Zn, 0.02% Fe and 0.02% Pb. The second alloy was taken from mill stock of 8.25 mm. gage and was rolled to get 4 bars reduced 2, 4, 6 and 6 B. & S. nos., respectively. This second alloy contained 68.48% Cu, 31.47% Zn, 0.02% Pb and 0.03% Fe. The grain sizes of the annealed alloy agreed closely when the previous heat treatment and reduction by rolling were made to correspond. The difference in thickness (9.4 to 3.3 mm. gage) does not appreciably affect the grain size or Brinell hardness. The grain size of the brass when annealed at low temps. is affected greatly by the previous grain size and by the reduction in rolling which the brass has undergone. The grain size and Brinell data for the several conditions described, when plotted against the temp., give curves that approach as a limit the curve of metal annealed after hard rolling. It would seem desirable to select as standard for grain size, as detd. by the temp. of annealing, specimens that have been reduced by rolling at least 50%. In the case of the cartridge brass with 68% Cu and 32% Zn, Brinell hardness does indicate grain size. At low annealing temps., the grain size is influenced by the grain size of the previous anneal. The finer the grain size of the previous anneal, the more closely will the curve of Brinell hardness vs. grain size approach the standard curve. Since grain size is influenced by that of the previous anneal and also by the reduction by rolling previous to annealing, it is better to det. the hardness by Brinell measurement than to attempt to judge it by the grain size.

W. T. H.

**Does forging increase the density of steel?** H. E. DOERR. *Bull. Am. Inst. Mining Eng.* 1919, 79-81.—Many practical men believe that forging greatly compresses or consolidates steel and would therefore, answer this question in the affirmative. The data here given, which were obtained by careful measurements on 10 ingots of basic open-hearth steel, show that if the original ingot is entirely free from cavities there is very little, if any, change in d. as a result of forging.

W. T. H.

**Notes on babbitt and babbitted bearings.** JESSE L. JONES. *Bull. Am. Inst. Mining Eng.* 1919, 95-6; cf. *C. A.* 12, 1965.—In the discussion of this paper the fact

was brought out that fluidity has a good deal to do with the practical value of babbitt metal. Dr. Frary's alloy of Pb hardened with Ca and Mg has not proved wholly successful in practice on account of the difficulty of pouring large castings.

W. T. H.

**Ferrous alloys.** I. JEAN ESCARD. *Rev. gén. sci.* 29, 673-80(1918).—The method of manufacture, chem. compn., properties and uses of Fe-Cr, Fe-Si, and Fe-Mn alloys are discussed in considerable detail.

W. T. H.

**The relative corrosion of alloys.** R. B. FEHR. *J. Am. Soc. Mech. Eng.* 40, 829-33 (1918).—To det. the extent of corrosion, the results have been in the past expressed by (a) loss in wt., (b) % loss of wt., (c) loss of wt. per unit of exposed surface; and (d) appearance as judged by the naked eye or with the aid of a lens. It is proposed as a better standard of comparison, to represent the corrodibility by a factor, K, which is obtained by dividing the % loss in wt. by the ratio of exposed surface in sq. cm. to the vol. of the specimen in cc. To illustrate the value of this method of comparison, values are given which are compared with the same results expressed by the other methods. Values are also given for the corrodibility of 5 alloys in tap water, 1% salt soln. and in 10% salt soln. It is evident that very consistent results can be obtained by this method when the duration of the test is 1 week for the more corrosive alloys and about 2 mos. for the more resistant alloys. In fact, 1 day is quite enough to classify groups of alloys in the order of their corrodibility for such corroding media as will cause enough loss in wt. to be detd. by an ordinary analytical balance.

W. T. H.

**A new principle for producing metal coatings.** M. U. SCHOOP. *Z. angew. Chem.* 31, I, 204(1918).—A "metal splashing" process has been devised for coating with Pb. The extremity of a Pb tube connected with a CO<sub>2</sub> bottle is held in a Bunsen flame. Melting Pb is acted upon by the CO<sub>2</sub> gas brought through the lead tube and is splashed up, in form of very small drops, against the object to be coated. In this way a uniform and adhering coating is obtained which consists of normal, pure, sound Pb. The purity of the Pb coating is secured by using an inert or reducing gas whereby all oxidation is prevented. The adherence obtained is so great that a sheet of Fe covered with Pb according to this process may be bent without scaling off of the Pb.

TH. VERHEGGEN.

**Splashing soldering process.** WITOLD KASPEROWICZ. *Chem. Ztg.* 42, 20(1918).—The metal splashing process can find application as a soldering process. The soldering wire is brought into the flame by means of a driving mechanism so that the flame, which is under pressure, effects the carrying up of the soldering metal.

TH. VERHEGGEN.

The importance of particle-size reduction before sampling for assay (ALLEN) 7. Checking calibration of thermocouples and pyrometers (ANON.) 1. A neon arc lamp for direct current (SCHROETER) 4.

GUENTHER, H. AND SCHOOP, M. U.: *Das Schoopsche Metallspritzverfahren, seine Entwicklung und Anwendung nebst einen Ueberblick über seine Stellung zu den übrigen Metallisierungsmethoden und einen Abriss seiner Patentgeschichte.* Stuttgart: 130 illus. 266 pp. 9 M.

**Flotation separation of sulfide ores.** A. G. BERTS. U. S. 1,286,922, Dec. 10. In flotation of sulfide ores, such as those which may contain Cu<sub>2</sub>S, Cl is added to an aq. flotation bath to increase the buoyancy of the particles of sulfides by oxidation of a portion with formation on the particles of a thin superficial film containing free S.

**Treating ores.** O. REECE. Brit. 120,044, Oct. 7, 1918. Fine ores, concentrates, slimes, dust, etc., are prepd. for smelting in a blast furnace by mixing them with binding and fluxing materials such as CaO, cement, gypsum, dolomite, S, or mixts. of these, damping with H<sub>2</sub>O, allowing the mixt. to stand for a time, briquetting in molds under pressure, and then subjecting the briquets to the action of steam under pressure. In some cases, combined S present in the original material may serve as the binding and fluxing agent.

**Treating copper ores.** N. C. CHRISTENSEN. U. S. 1,286,531, Dec. 3. The pat. relates to the treatment of Cu ore which may also contain Au or Ag. It is especially adapted for application to oxidized or partly oxidized or roasted sulfide ore. The ground ore is agitated with a solution of SO<sub>2</sub> in H<sub>2</sub>O until all the Cu is brought into soln. The mixt. is then heated to boiling and agitated until the excess SO<sub>2</sub> is driven off and the Cu pptd. as cuprocupric sulfite. The latter is then sepd. by flotation. CaO may be added prior to boiling to cause pptn. of CuSO<sub>4</sub> as sulfite during the boiling. The Au and Ag values are also caused to float in this method.

**Treating copper ores.** N. C. CHRISTENSEN. U. S. 1,286,532, Dec. 3. A thick aq. pulp of Cu ore is treated with SO<sub>2</sub> in the presence of an excess of metallic Cu at a temp. of about 100° and the cupro-cupric sulfite formed and excess of Cu are removed from the gang by flotation.

**Smelting sulfide ores of copper.** G. N. KIRSEBOM. U. S. 1,286,652, Dec. 3. An unroasted sulfide ore rich in Cu is smelted with a roasted sulfide ore containing Cu in the presence of SiO<sub>2</sub> and of a quantity of coke sufficient to effect reduction of Fe<sub>2</sub>O<sub>3</sub> to FeO, in an elec. resistance furnace, to obtain a rich Cu mat suitable for reduction in a Bessemerizing furnace.]

**Treating ores containing molybdenum.** A. L. PELLEGRIN. U. S. 1,286,400, Dec. 3. Refractory ores containing oxidized compds. of Mo, V, U or similar metals are reduced to a fineness of 150 mesh, mixed with strong H<sub>2</sub>SO<sub>4</sub> and the acid soln. is sepd. and neutralized and the metal pptd. from it by H<sub>2</sub>S.

**Recovering metals from ores.** A. H. SINN. Norw. 28,713, Apr. 8, 1918. Au, Ag and Cu ores are crushed and sepd. in such manner that the portions passing through the sifting cloth attached to the fine crusher are sepd. by air blast in a special app., the non-metallic dust being removed and the coarser particles being returned to the app. for re-treatment with fresh ore. The metallic particles remaining in the sifting cloth in the crusher are removed and treated chem.

**Separating lead and zinc from ores.** C. E. CORNELIUS. Swed. 43,987, May 1, 1918. The process is dependent upon the different temps. of reduction and boiling of the Pb and the Zn.

**Smelting iron ore.** G. C. CARSON. U. S. 1,287,221, Dec. 10. In smelting Fe ore with natural gas or petroleum or both, the fuel is dehydrogenated, soot deposited is freed from S by heating to form CS<sub>2</sub> and the C thus obtained from the fuel is used to deoxidize the ore and produce metallic Fe.

**Steel alloy.** J. W. WEITZENKORN. U. S. 1,287,153, Dec. 10. A steel alloy is formed containing about 0.35% C, 1% Cr, 0.15% V, and 0.75-1.00% Mo. The alloy is especially adapted for machine parts where toughness is required.

**Alloy for bearings.** W. D. BERRY. U. S. 1,286,921, Dec. 10. A bearing alloy is formed of Cu 60-85, Pb 1-35 and Sb 3-20%; preferably, Cu 79, Pb 14, Sb 6 and P 1%. Small amts. of Ni, Mn, Si or Mg may be added.

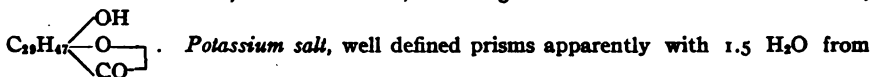
**Fluxes.** AKT.-GES. FÜR AUTOGENE ALUMINIUM SCHWEISSUNG. Brit. 120,005, May 28, 1918. A flux for use in autogenous welding of Al and its alloys consists of a

mixt. of alkali metal halides comprizing at least 3 different halogens, of which F is one. An example contains 4 parts of KCl, 3 of NaCl, and 1 each of LiCl, KBr, and NaF. In some cases, an alkali metal iodide may be added. Cf. 24,096, 1907, 24,283, 1907, 8,778, 1909, and 29,084, 1910.

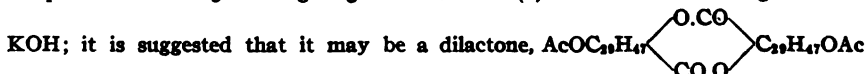
## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

The isomeric lactones, caryophyllin and urson. FRANCIS D. DODGE. *J. Am. Chem. Soc.* 40, 1917-39(1918).—Caryophyllin (a) can be freed from the amorphous impurities which always accompany it when prepd. by the methods hitherto described by heating with aq. alc. KOH, filtering hot and reprecip. the K salt which crystals out from cold MeOH with H<sub>2</sub>O or by decolorizing a slightly alk. soln. of (a) in MeOH with concd. aq. KMnO<sub>4</sub>. From the soln. of the K salt in boiling MeOH and a slight excess of HCl, pure (a) crystals slowly. It seps. from EtOH in needles resinous to the touch, apparently with H<sub>2</sub>O, m. (anhydrous) about 310°, sublimes *in vacuo* 280-300° and under atm. pressure, with partial decompn., above 310°, sol. in 35 parts boiling 95% EtOH, 106 parts at 20°, 65 parts Et<sub>2</sub>O, 118 parts CHCl<sub>3</sub>, 180 parts Me<sub>2</sub>CO, 235 parts MeOH, insol. in aq. alkalis, sol. in 4 parts of 0.5 N KOH in MeOH, [α]<sub>D</sub><sup>20</sup> 54.5° (0.77 g. in 10 cc. alc.). The K salt shows [α]<sub>D</sub><sup>20</sup> 63.40° (0.224 g. in 10 cc. 95% alc.), [α]<sub>D</sub><sup>24.6</sup> 67.70° (0.9519 g. in 10 cc. MeOH). In alc. (a) can be titrated with phenolphthalein, especially if towards the end the soln. is chilled until the greater part of the salt has crystd. out. The alc. soln. exactly neutral when cold becomes alk. on heating. The acid value found was 123-124.8, whence it is probable that the formula for (a) is C<sub>20</sub>H<sub>34</sub>O<sub>3</sub>, with one CO<sub>2</sub>H or lactone group, and the behavior of the salts and the formation of two Ac derivs., described below, are in agreement with the lactone structure,



an aq. alc. KOH soln. of (a), sol. in 36 parts EtOH at 20° and 2.5 parts MeOH, partially hydrolyzed by digestion with H<sub>2</sub>O; the alkali liberated can be titrated in the presence of (a); CO<sub>2</sub> ppts. (a) from the alc. soln. Various other metallic salts can be obtained by pptn. from alc. solns. of the alkali salts with alc. solns. of metallic chlorides or acetates. The calcium, lead, magnesium, zinc and silver salts have been prepd. Caryophyllin diacetate (diacetylcaryophyllinic acid), C<sub>20</sub>H<sub>47</sub>(OAc)<sub>2</sub>CO<sub>2</sub>H, is obtained by heating (a) with 4 parts Ac<sub>2</sub>O 6 hrs. at 100°, decomp. the Ac<sub>2</sub>O with ice water, washing with dil. Na<sub>2</sub>CO<sub>3</sub>, drying *in vacuo*, dissolving in Et<sub>2</sub>O (avoiding all heating) and evap. at a low temp.; acid value, cold, 100.8; sapon. value after heating, 297.7. Heated at 185-90° in a slow current of air it loses AcOH (8.8%; calcd., 10.7%). The soln. in 12 parts of glacial AcOH at 100° deposits on cooling snowy crystals consisting almost entirely of the monoacetate; the latter is easily obtained by recrystg. the diacetate from 35-40 parts boiling alc. and seps. in needles with about 5 H<sub>2</sub>O, quickly efflorescing in the air, m. (anhydrous) 260-5° (apparent decompn.); acid value, cold, 105-111.7; sapon. value, 215-27; heated with 3 parts Ac<sub>2</sub>O 1-2 hrs. at 100° it is entirely converted into the diacetate; its potassium salt seps. in needles from EtOH-Et<sub>2</sub>O. In the prepn. of the diacetate is obtained a very slightly sol. substance showing no acid value and a sapon. value of 223.2 and giving the K salt of (a) on continued heating with alc.



The analysis of Herzog's carbaminic ester and Ac deriv. of (a) (*Ber.* 13, 800(1880))

agrees as well, if not better, with the formula for (a) proposed by D. When 8 g. caryophyllic acid (b) (Mylius, *Ber.* 6, 1053(1873)) in 50 cc. of 0.5 N alc. KOH is treated with 2 g. AcOH, the acid potassium salt,  $C_{27}H_{44}O_7(CO_2H)CO_2K \cdot 4H_2O$ , slowly seps.; acid value (anhydrous) 187.5. If (b) is heated 1-2 hrs. at 100° with 3 parts Ac<sub>2</sub>O there are obtained crystals m. 210-3°, with an acid value (cold) 215.3-224.5 and a sapon. value 316-323; these are much lower than would be expected and it is suggested that secondary reactions have taken place during the acetylation, with elimination of 1 mol. CO<sub>2</sub> and lactone formation by the other two CO<sub>2</sub>H groups, the product being an acetyldilactone,  $C_{25}H_{40}O_6$ , with a calcd. acid value 218.1 and sapon. value 327.2. The product of its sapon. is not the original (b) but apparently a new acid or a mixt. of acid and lactones, partially sol. in alkali carbonates and wholly in warm dil. alkalies. Two samples of urson (c), one Merck's "Urson puriss," and another prepd. from bearberry leaves by the method described above for the purification of (a), were studied. In strictly chem. properties no differences were observed between (a) and (c) but (c) differs from (a) in that its K salt is very sol. in alc., the K salts of the mono- and diacetates are slightly sol. in alc., the monoacetates are slightly sol. in alc., the monoacetate crysts. in prisms stable in air and sol. to the extent of 1.4% in alc. at 25°, the Mg salt is easily sol. in alc. and the (c) itself is easily sol. in alc. NH<sub>3</sub>. The difference in soly. of the K salts can be utilized to effect a partial sepn. of (a) and (c). These differences appear to D. sufficient to warrant the assumption that (a) and (c) are isomers of very similar structure. Gentiol, lactucon, vitin and encarpol are, judging from the descriptions of their properties in the literature, possibly identical with (a) or (c).

CHAS. A. ROUILLER.

**Quinone-phenolate theory of indicators. Spectrophotometric study of the "end points" and "fading" of phenolsulfonephthalein indicators.** CHARLES L. BRIGHTMAN, J. J. HOPFIELD, M. R. MEACHAM AND S. F. ACREE. *J. Am. Chem. Soc.* 40, 1940-4 (1918).—The details of the spectrophotometric method used will be published later; the general plan was to find the wave lengths at which the indicator solns. give a transmission of 20, 40, etc., % and to calc. the corresponding absorption indexes and draw a curve through these points. Phenolsulfonephthalein (a) and the tetra-NO<sub>2</sub> (b) and tetra-Br (c) derivs. were studied. These are twice as deeply colored as phenolphthalein in alkalies and show sharper color changes. The excess of alkali necessary to produce the "end point" does not cause any appreciable fading in either short or long time periods in the case of (a) or (c). The color of (a) in phosphate buffer solns. does not fade appreciably in considerable time periods. Standardized stock solns. of (a) can be kept without appreciable change in an ice box or even at ordinary temp. if care is taken to prevent contamination. Different samples of the same lot of well mixed solid (a) give the same absorption index when treated with an excess of alkali. Excess of alkali in solns. of (b) causes a fading of the intense red to a light yellow color, the time of fading depending upon the amt. of alkali and other exptl. conditions.

CHAS. A. ROUILLER.

**Tetramethylammonium azide.** FRANK V. FRIEDLANDER. *J. Am. Chem. Soc.* 40, 1945-7(1918).—*Tetramethylammonium azide*, prepd. by slowly adding somewhat less than 1 mol. of 1% NMe<sub>4</sub>I to a suspension of AgN<sub>3</sub> in cold H<sub>2</sub>O with thorough but cautious shaking, filtering, concg. on the H<sub>2</sub>O bath to the point of crystn. and allowing to cool, is fairly stable, does not explode when struck with a hammer, ground in a mortar or dropped on a hot plate; begins to decomp. about 125°, more rapidly at higher temps. with the evolution of vapors of fishy odor; 1 cc. of the satd. solns. at 20° contains approximately the following amts. (g.) of the salt: H<sub>2</sub>O, 0.5; EtOH, 0.05; MeOH, 0.02; C<sub>6</sub>H<sub>6</sub>, 0.004; CHCl<sub>3</sub>, 0.001; Et<sub>2</sub>O, 0.0005. With CCl<sub>4</sub> is formed a two liquid layer system, the lower layer containing at 20° in presence of an

excess of the solid phase suspended in the upper layer about 0.005 g. per cc. The crystals of the salt belong to the tetragonal system,  $a : c = 1 : 0.7245$ , with prismatic habitus, angle (110) to (111) =  $59^{\circ} 36'$ , parallel extinction, very strong double refraction and negative optical character. Preliminary expts. on the thermal treatment of the salt gave no positive indications of any mol. transformation into  $\text{Me}_3\text{NN}:\text{NNMe}_3$ .

C. A. R.

**Derivatives of trihalogen tertiary butyl alcohols. II. The propionic and butyric esters of tribromotertiarybutyl alcohol (brometone).** T. B. ALDRICH. *J. Am. Chem. Soc.* 40, 1948-50(1918); cf. *C. A.* 11, 337.—*Tribromotertiarybutyl propionate*, from 4 parts of the alc. and 1 part  $\text{EtCOCl}$ , m.  $27^{\circ}$ , decompd. slowly by boiling  $\text{H}_2\text{O}$  or 10%  $\text{H}_2\text{SO}_4$ , more rapidly by boiling 10%  $\text{NaOH}$ , in a few mins. by an excess of boiling concd.  $\text{HNO}_3$ , volatilizes very slowly in the air. *Butyrate* b<sub>14</sub> 144-5°. Neither ester appears to have anesthetic properties or to exert any very appreciable action upon the heart or general circulation.

C. A. R.

**Organic chemical reagents. II. Amylene, tertiary amyl alcohol.** ROGER ADAMS, O. KAMM AND C. S. MARVEL. *J. Am. Chem. Soc.* 40, 1950-5(1918); cf. *C. A.* 12, 2321.—Detailed description of the prepn. of amylene by the  $\text{H}_2\text{SO}_4$  and the pyrogenic catalytic methods as worked out at the Univ. of Illinois. By the first method a student provided with eight 3-l. flasks and the proper reflux condensers can prep. 2-3 lbs. amylene in 1 day; by the second method, with an app. which can be easily made by any plumber and which can be used for many other catalytic processes, 5 lbs. amylene can easily be made from  $\text{AmOH}$  in 1 day at a cost much below Kahlbaum's pre-war price. From 325 g. of the amylene, 275-300 g. tertiary amyl alc., b.  $100-3^{\circ}$ , can be obtained with  $\text{H}_2\text{SO}_4$ .

C. A. R.

**Identification of the cinchona alkaloids by optical crystallographic measurements.** EDGAR T. WHERRY AND ELIAS YANOVSKY. *J. Am. Chem. Soc.* 40, 1955-6(1918).—Correction of minor errors occurring in the paper abstracted in *C. A.* 12, 1780.

C. A. R.

**Relative activities of methyl, ethyl, and propyl iodides with sodium  $\alpha$ - and  $\beta$ -naphthoxides.** HENRY E. COX. *J. Chem. Soc.* 114, 666-74(1918).—C. studied the velocity of the reaction between  $\text{MeI}$ ,  $\text{EtI}$ , and  $\text{PrI}$  and  $\alpha\text{-C}_{10}\text{H}_7\text{ONa}$  (A) and  $\beta\text{-C}_{10}\text{H}_7\text{ONa}$  (B) in abs. alc. at  $40^{\circ}\text{C}$ . The reaction is a bimol. one of a special type in which the velocity is dependent upon the initial concn. Some evidence is presented to show that both (A) and (B) undergo alcoholysis in  $\text{EtOH}$  soln. (A) is more reactive towards the alkyl iodides than is (B). If an excess of  $\alpha$ - or  $\beta$ -naphthol is present in the reaction mixt. the velocity coeff. is decreased. The velocity of reaction in each case increases with the diln., the most marked increase being noted in the case of  $\text{MeI}$ . The empirical equation (cf. Hecht, Conrad, and Brückner, *Z. physik. Chem.* 5, 289),  $Kv = K_1 + a \log v$  (where  $v$  is the vol. in l. containing 1 mol. of the reacting substances) may be used to express the velocity of the reactions, within certain limits. The equation is applicable with  $\text{EtI}$  and  $\text{PrI}$  up to the diln.  $v = 40$ , and with  $\text{MeI}$  up to dilution  $v = 10$  in the case of (A) and  $v = 7$  in the case of (B). At higher dilns. the reactivity of  $\text{MeI}$  increases.  $\text{MeI}$  is several times more active than is  $\text{EtI}$ , which in turn is more active than  $\text{PrI}$ . Summarized tabulated data are given.

LOUIS E. WISE.

**Azo dyes derived from *m*-phenetidine.** F. REVERDIN, A. RILLIET AND C. VERNET. *Arch. sci. phys. nat.* 46, 74-80(1918).— $3\text{-H}_2\text{NC}_6\text{H}_4\text{OEt}$  couples with  $\text{PhN:NCl}$ , to form  $\text{benzeneazo-}m\text{-phenetidine}$  (A),  $\text{PhN:N.C}_6\text{H}_4(\text{OEt})(\text{NH}_2)$ , orange leaflets, m.  $84-5^{\circ}$ . Since the reduction of (A) with  $\text{NaHSO}_3$  yields a typical *p*-diamine, it is evident that the coupling takes place in a *p*-position to the  $\text{NH}_2$  group. The hydrochloride of (A),



m. 152-3°; the *acetyl derivative*, reddish brown prisms, m. 135°; the *benzoyl derivative*, flat, orange needles, m. 146°. With suitable precautions (A) may be diazotized and coupled with phenols and amines. (A) is dissolved in concd.  $\text{H}_2\text{SO}_4$ , and the soln. cautiously dild. to prevent pptn., and diazotized at 0-2°. The product couples with phenols in the presence of  $\text{Na}_2\text{CO}_3$ , and with amines in the presence of  $\text{AcONa}$ . The following dyes were formed from (A): (with  $\alpha$ -naphthol)  $\text{PhN}_2\text{C}_6\text{H}_4(\text{OEt})\text{N}:\text{N}-$   
 $\text{C}_{10}\text{H}_7\text{OH}$ , brown needles from  $\text{AcOH}$ , m. 172°; (with *R*-salt),  $\text{PhN}:\text{NC}_6\text{H}_4(\text{OEt})\text{N}:\text{N}-$   
 $\text{C}_{10}\text{H}_4(\text{OH})(\text{SO}_3\text{H})_2$ , reddish violet powder, dyeing silk a bright purplish red and wool  
 a somewhat less brilliant shade; (with naphthionic acid),  $\text{PhN}_2\text{C}_6\text{H}_4(\text{OEt})\text{N}_2\text{C}_{10}\text{H}_6-$   
 $(\text{NH}_2)(\text{SO}_3\text{H})$ , dark brown powder, dyeing silk a reddish brown. Many other analogous  
 dyes were also prepd., but only a few of them are mentioned and none of them appears  
 to have more than academic interest. The interaction of 3- $\text{HO}_2\text{S}\cdot\text{C}_6\text{H}_4\text{N}_2\text{Cl}$  with  
 3- $\text{H}_2\text{NC}_6\text{H}_4\text{OEt}$  gave rise to *m-sulfobenzeneazo-m-phenetidine* (C), reddish brown micro-  
 needles, m. 214-5°. (C) may be diazotized by dissolving in  $\text{Na}_2\text{CO}_3$ , neutralizing  
 the soln. with a mineral acid (which ppts. (C) in finely divided form) and treating the  
 amorphous product with  $\text{NaNO}_2$ . The diazonium salt (D) thus formed is cryst. (D)  
 when coupled with 1,3,6,8-(HO)(HO $_2\text{S}$ ) $_2$ ( $\text{H}_2\text{N}$ ) $\text{C}_{10}\text{H}_2\text{N}:\text{N}\cdot\text{C}_6\text{H}_4\text{NO}_2$  gave rise to the tris-  
 azo dye: (HO $_2\text{S}$ ) $\text{C}_6\text{H}_4\text{N}_2\cdot\text{C}_6\text{H}_4(\text{OEt})\text{N}:\text{NC}_{10}\text{H}_2(\text{OH})(\text{NH}_2)(\text{SO}_3\text{H})_2\cdot\text{N}_2\cdot\text{C}_6\text{H}_4\text{NO}_2$ , dark  
 green powder dyeing wool bluish green to greenish black. By coupling the diazonium  
 salt derived from 4- $\text{O}_2\text{NC}_6\text{H}_4\text{N}:\text{N}\cdot\text{C}_6\text{H}_4(\text{OEt})\text{NH}_2$  with 1,8,3,6-(HO) $_2$ (HO $_2\text{S}$ ) $_2\text{C}_{10}\text{H}_4$ , a  
 dark brown powder (E) was obtained, which dyed wool a dull violet shade. On reduc-  
 tion with  $\text{Na}_2\text{S}$ , (E) gives rise to  $\text{H}_2\text{N}\cdot\text{C}_6\text{H}_4\text{N}:\text{NC}_6\text{H}_4(\text{OEt})\text{N}:\text{N}\cdot\text{C}_{10}\text{H}_2(\text{OH})_2(\text{SO}_3\text{H})_2$ ,  
 a brown powder that dyes wool blue. 3- $\text{H}_2\text{NC}_6\text{H}_4\text{OEt}$  apparently does not couple  
 readily with diazo compds. of very high mol. wt.

LOUIS E. WISE.

**Benzoylation of some aromatic hydroxy and amino derivatives.** FRÉDÉRIC REVERDIN. *Helvetica chimica acta* 1, 205-9(1918).—A very convenient benzoylation reaction is described. The phenol or amine is mixed with the theoretical amt. of  $\text{BzCl}$  and 2-3 drops of concd.  $\text{H}_2\text{SO}_4$  are added to the mixt., which is then heated moderately on the steam bath (or at a lower temp). By this method R. prepd. 1,3-(BzO) $_2\text{C}_6\text{H}_4$ , leaflets, m. 117°, in 70% yield together with smaller amts. of 1,3-(HO)(BzO) $\text{C}_6\text{H}_4$ , m. 132°; 1,2-(BzO) $_2\text{C}_6\text{H}_4\cdot\text{CO}\cdot\text{C}_6\text{H}_4\cdot\text{CO}$ , yellow needles, m. 210-11°; 2,4-(O $_2\text{N}$ ) $_2\text{C}_6\text{H}_3\text{NHBz}$ ,  
 needles, m. 201-2°; 1-BzNHC $_6\text{H}_4\cdot\text{CO}\cdot\text{C}_6\text{H}_4\cdot\text{CO}$ , microneedles, m. 246° and 2-BzNH-  
 $\text{C}_6\text{H}_3\cdot\text{CO}\cdot\text{C}_6\text{H}_4\cdot\text{CO}$ , needles, m. 227°. All of the above compds. have been previously  
 described either in the chem. literature or in patents. They are all readily hydrolyzed  
 by concd.  $\text{H}_2\text{SO}_4$  at the temp. of the steam bath.

LOUIS E. WISE.

**Transformation of levoglucosane into dextrin.** AMÉ PICTET. Univ. Geneva. *Helvetica chimica acta* 1, 226-30(1918).—When levoglucosane (A) is rapidly heated to 180° it melts to a clear liquid, which shows no change on further rapid heating until 270° is reached, whereupon a deep-seated decompn. takes place, with the formation of  $\text{H}_2\text{O}$ ,  $\text{HCO}_2\text{H}$ ,  $\text{AcOH}$ ,  $\text{Me}_2\text{CO}$  and phenols. If, however, (A) in the liquid phase is kept for about 0.5-1 hr. at 240°, polymerization takes place. The polymer appears to be a *dextrin* (B), which may be purified by soln. in  $\text{H}_2\text{O}$ , and pptg. with alc. (B) can be much more conveniently prepd. by mixing (A) with a small amt. of Pt black (prepd. by Loew's method, *Ber.* 23, 289) and heating the mixt. to 180°. The polymerization proceeds very smoothly and rapidly at this temp. (B) formed by this method is almost

colorless, and very nearly pure. It has  $[\alpha]_D^{111.9'}$  and appears to have the formula  $(C_6H_{10}O_4)_4$ . Its aq. soln. gives no coloration with I, and is not pptd. by  $Na_2SO_4$ , gallic acid,  $Br-H_2O$  or  $(AcO)_2Pb$ . Fehling soln. is very slightly reduced after long boiling with (B). When treated with aq.  $H_2SO_4$ , (B) is hydrolyzed to glucose. (B) is not fermented by yeast, and appears to be related to an achroodextrin obtained from starch by treatment with  $(CO_2H)_2$  (cf. Wacker, *Ber.* 42, 2675). In some respects it is also similar to the artificial dextrins described by Grimaux and La Fevre (*Compt. rend.* 103, 146(1886)).

LOUIS E. WISE.

**Different processes for the production of quinone.** CLAUDIUS CHAVRAU. *Rev. prod. chim.* 21, 288-92(1918).—A critical review of the principal methods used in the manufacture of quinone. C. has made a comprehensive study of the quinone synthesis from the industrialist's standpoint and some of his exptl. data are given. The method of Ludwig and Guttermann (ref. not given), which involves the oxidation of  $PhNH_2$  in 2 stages by means of  $CrO_3$ , gives a 50-60% yield of quinone. Other methods involving the oxidation of  $PhNH_2$  are of little industrial interest. Of the electrolytic methods for the oxidation of  $C_6H_6$  to quinone, that of Kempf (D. R. P. No. 117251) appears to be the best. The reaction is carried out in a  $H_2SO_4-C_6H_6$  emulsion, with a Pb cathode and  $PbO_2$  anode, using a current of 3-4 amp. per sq. dcm. of anode (e. m. f. 3-4 v.). Of the  $C_6H_6$  oxidized, 65-70% is converted into quinone. The electrolytic method presents advantages over the  $CrO_3$  method since starting materials are cheaper, and since the operation is more readily controlled.

LOUIS E. WISE.

**Manufacture of monochloroacetic acid.** GUY CHAZEL. *Rev. prod. chim.* 21, 267-8(1918).—A brief article describing the production of  $CH_2ClCO_2H$  on a com. scale. No new data are given.

LOUIS E. WISE.

**Syntheses by means of sodamide. VII. Preparation and study of certain monoalkyl and dialkylcamphors and their derivatives.** A. HALLER AND J. LOUVRIER. *Ann. chim.* 9, 189-251(1918).—A collective article (cf. C. A. 8, 2147).

LOUIS E. WISE.

**Products of the condensation of phenols with aldehydes.** A. HUTIN. *Mon. sci.* 8, II, 217-23(1918).—A descriptive article giving no new exptl. data.

LOUIS E. WISE.

**The double acid from normal and allo-cinnamic acids.** A. W. K. DE JONG. *Proc. Acad. Sci. Amsterdam* 20, 1230-3(1918).—The double acid may be prepd.: (1) by allowing a soln. satd. at room temp. with respect to both the normal and the allo-acids, to cryst. slowly; (2) by prep. a hot soln. satd. with both acids, and allowing the soln. to cool; (3) by prep. an aq. soln. of Na *n*-cinnamate (10 g. per l.) exposing the soln. to light in an open vessel (for several months), evapg. to dryness, liberating the mixed acids by means of concd. HCl, and crystg. the double acid from petr. ether, from which it is deposited in the form of rhombs. In a series of preliminary expts. de J. was able to isolate but one double acid, although 2 modifications of the *n*-acid and 3 forms of the allo-acid (m. 42°, 58°, and 68°) are known to exist. All samples of the double acid (consisting of equal parts of the allo- and *n*-acids) sintered at 56° and m. about 90°. Analyses of the double acid were carried out by a method described in C. A. 6, 2746.

LOUIS E. WISE.

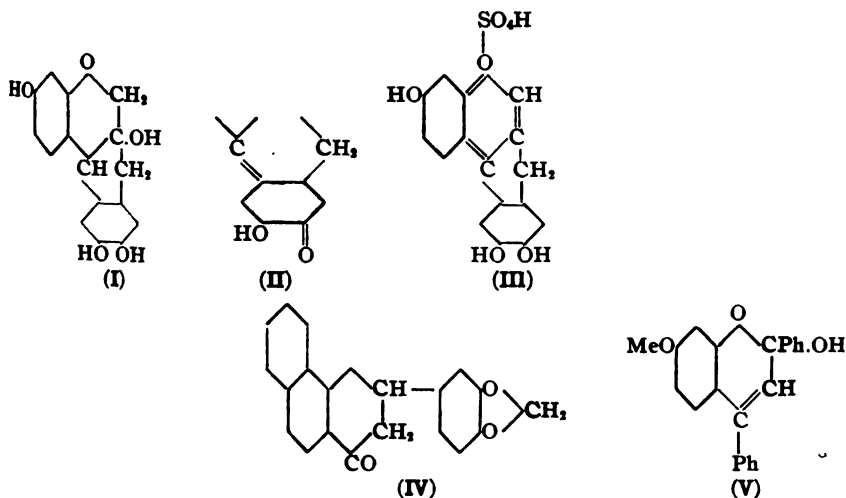
**Hydrindene-1,2-diol(1,2-hydroxyindane).** J. BÖRSEKEN AND CHR. VAN LOON. *Proc. Acad. Sci. Amsterdam* 20, 1186-91(1918).—B. and v. L. have synthesized the *cis* and *trans*-1,2-hydroxyindanes (A) and (B), resp. (cf. Heusler and Schieffer, *Ber.* 32, 28(1899) and Weizberger *Ber.* 44, 1436(1911)). (A), felted needles (from  $C_6H_6$ ), sintering 105.5°, m. 107.5-8°, was prepd. by oxidizing an aq. indene emulsion with  $KMnO_4$ . The yield was 13% of the theoretical. (B) was formed by boiling indene dibromide with AcOK in AcOH, isolating the diacetate of (B), b<sub>12</sub> 169-9.5,  $d_{20}^{20}$  1.1771,

$n_D^{20}$  1.5170, and sapon. the latter with aq. KOH. (B), after sublimation *in vacuo*, and recrystn. from PhMe was obtained as leaflets, m. 159.8–60.0°. The *dibenzoate* of (A) m. 109.5–10.5°; the *dibenzoate* of (B), m. 76.5–77.5°. The *diphenylurethan* of (A), m. 205° (decompn.); that of (B), m. 206.5°. All derivs. of (B) on sapon. were reconverted into (B). The *cis*-compds. (derived from (A)) on sapon. yielded a new *diol* (C), m. 100.5–101.5°, even after recrystn. and sublimation. (C) appears to be a polymorphic modification of (A), since a mixt. of (C) and (A), m. 107.5–108°. The configurations of (A) and (B) were detd. by B.'s boric acid-conductivity method (C. A. 6, 623).

*Indene oxide* (D),  $C_9H_8CH_2CH=CH_2$ , rhombic plates, m. 31–31.5°,  $n_D^{20}$  1.1258,  $n_D^{25}$  1.5627, was formed in nearly theoretical yield, by treating indene bromohydrin in  $Et_2O$  with powdered KOH. Attempts to obtain (D) from the iodohydrin proved unsatisfactory. By boiling (A), (B), or (D) with aq.  $H_2SO_4$ ,  $\beta$ -indanone (E), m. 57–8°, was obtained. Isomerization of (D) to (E) also takes place when  $H_2O$  is absent (in dry  $Et_2O$  by means of  $ZnCl_2$ ). (D) may be hydrated under proper conditions (very dil. acid?), yielding a mixt. of (A) and (B), indicating that a partial change of configuration has taken place. Under most conditions, however, hydration of (D) resulted in the formation of an insol. compd., together with some (E).

LOUIS E. WISE.

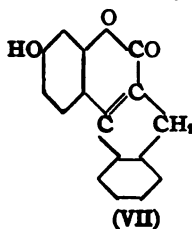
**Synthesis of isobrazilein and certain related anhydropyranol salts. I. HERBERT GRACE CRABTREE AND ROBERT ROBINSON. Univ. Liverpool. *J. Chem. Soc.* 113, 859–80(1918).**—Hitherto no deriv. of brazilein (I) has been synthesized containing the characteristic fused ring system. (I) may be oxidized to the quinone brazilein (II), which is converted by mineral acid into the isobrazilein salts (III) (Hummel and A. G. Perkin, *J. Chem. Soc.* 41, 367(1882); Engels, P., and R., *C. A.* 2, 3064). Derivs. of the tri-Me ether of (III) (A) have now been synthesized. *Preliminary expts.*: Friedländer's process (*Ber.* 28, 1946(1895)) for the prepn. of 2-AcC<sub>10</sub>H<sub>7</sub>OH was modified as follows: An intimate mixt. of 50 g.  $\alpha$ -C<sub>10</sub>H<sub>7</sub>OH, 75 g. HOAc, and 75 g.  $ZnCl_2$  was heated 0.5 hr. at 160–70°, treated with  $H_2O$ , and the ppt. washed with dil. HCl, dried, and recrystd. 3 times from MeOH, when it was pure enough for the next step, the synthesis of 3,4-CH<sub>2</sub>O<sub>2</sub>C<sub>6</sub>H<sub>5</sub>CH:CHCOC<sub>10</sub>H<sub>7</sub>OH (B) (Kostanecki, *Ber.* 31, 707(1898)). 10 g. of this were dissolved in 600 cc. hot alc., treated with 80 cc. concd. HCl and 240



cc.  $\text{H}_2\text{O}$ , and boiled under reflux for 24 hrs.; on cooling, the flavonone, 3',4'-methylene-dioxy-2-phenyl-2,3-dihydro-1,4- $\alpha$ -naphthopyrone (IV) sepd., colorless needles after recrystg. from alc.-HCl and then twice from alc., m.  $145^\circ$ , easily reconverted into (B) by NaOH; let stand overnight with 3,4- $\text{CH}_2\text{O}_2\text{C}_6\text{H}_4\text{CHO}$  in HOAc after satg. with HCl gas it gives the *piperonylidene derivative*, golden needles, m.  $206^\circ$ , gives a reddish purple color in  $\text{H}_2\text{SO}_4$  and yields dark green condensation products of unknown constitution when treated with vigorous acid condensing agents. 10 g. 2,4-(HO) $_2$ C $_6$ H $_3$ COCH $_2$ -CH $_2$ Ph (C) were mixed with 15 g. fused NaOAc and 20 g.  $\text{Ac}_2\text{O}$  and heated 4 hrs. in an oil bath at  $170^\circ$ , followed by cooling, addition of  $\text{H}_2\text{O}$  and dil. HCl; the resulting *acetyl derivative*, C $_{19}$ H $_{16}$ O $_4$ , needles from MeOH, m.  $121^\circ$ , dissolves in  $\text{H}_2\text{SO}_4$  to a faintly yellow soln. which fluoresces violet on heating, is not changed by dil. aq. NaOH, but on boiling 2.5 hrs. with excess dil. aq.  $\text{Na}_2\text{CO}_3$  it is hydrolyzed and dissolves, 7-hydroxy-3-benzyl-2-methyl-1,4-benzopyrone sepg., needles from alc., m.  $282^\circ$ , shows a violet fluorescence in alk. soln. or on heating the soln. in  $\text{H}_2\text{SO}_4$ ; when 2 g. were dissolved in hot MeOH and boiled with 5 cc.  $\text{Me}_2\text{SO}_4$ , adding 10 cc. 40% aq. KOH during 5 min., pptg. with  $\text{H}_2\text{O}$ , taking up in Et $_2\text{O}$  and washing the soln. with dil. NaOH, the *methyl ether* (D) was obtained, needles from MeOH, m.  $109^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with a faint blue fluorescence which increases on standing or warming gently, the effect apparently being due to sulfonation and not to the formation of a pyrrylium salt containing the indene nucleus. 1.5 g. (D), 2 g. KOH, and 10 cc. MeOH were heated in a wide test tube, allowing part of the MeOH to distil off. After the 1st red color had changed to yellow the residue and distillate were distd. with steam,  $\text{AcCH}_2\text{CH}_2\text{Ph}$  passing over; its semicarbazone m.  $145^\circ$ , not  $142^\circ$  (Klages, *Ber.* 37, 2323(1904)); the residual liquid was acidified with HCl, and made alk. with  $\text{Na}_2\text{CO}_3$ , 2,4-HO(MeO)C $_6$ H $_3$ COCH $_2$ CH $_2$ Ph (a, see below) pptg. The aq. soln. from this was extd. with Et $_2\text{O}$ , concd., and acidified, yielding 2,4-HO(MeO)C $_6$ H $_3$ CO $_2$ H, these products proving the structure of (D). Methylation of 2,4-(HO) $_2$ C $_6$ H $_3$ Ac to paeanol (E) cannot be satisfactorily carried out with  $\text{Me}_2\text{SO}_4$ , the di-MeO ether (F) being the main product; the best method is to use 1.1 mols. of MeI and KOH in boiling MeOH soln. If 3 mols. MeI and KOH are used the isomeric di-Me deriv. (G), containing 1 of the Me groups in the aromatic nucleus is formed. Attempts to obtain (G) from (E) and 2 mols. of MeI and KOH gave mainly unchanged (E); the small portion insol. in cold dil. aq. NaOH was a mixt. of (F), insol., and (G), sol. in warm dil. NaOH. It thus appears that in using 3 mols. MeI and KOH originally C-methylation preceded O-methylation. The presence or absence of the nuclear Me group in derivs. of the type of 2,4-(HO) $_2$ C $_6$ H $_3$ CO $_2$ H or resorcylic ketone derivs. may be detd. by the formation of homofluorescein, or fluorescein, resp. The substance is strongly heated with o-C $_6$ H $_4$ (CO) $_2$ O and a few drops  $\text{H}_2\text{SO}_4$  and the product dissolved in dil. NaOH. Under these conditions fluorescein is formed even from the ethers of m-C $_6$ H $_4$ (OH) $_2$ . However, if the nucleus is alkylated the alk. soln. is intense cherry-red, and the fluorescence is less persistent on diln. Bargellini and Marantonio (*C. A.* 3, 170) describe a monomethyl ether of (C), m.  $74-5^\circ$  and a di-Me ether, m.  $103-4^\circ$ . C. and R. were unable to isolate the former, while the latter turned out to be the actual mono-Me ether, 2-hydroxy-4-methoxyphenyl phenylethyl ketone (a, see above), needles, m.  $105^\circ$ , which may also be prepd. by using 0.5 the calcd. amt.  $\text{Me}_2\text{SO}_4$  or by using MeI; it dissolves in hot aq. NaOH and in alc. soln. gives a red-violet color with  $\text{FeCl}_3$ ; could not be converted into a definite Ac or Bz deriv. or Me ether. The structure of (a) is proved by the following method of prepn.: 5 g. benzylidenepaeanol (b) were dissolved in 250 cc. alc. at  $50-60^\circ$ , the air in the flask expelled by H, and treated with 15 cc. each of 1% solns. of  $\text{PdCl}_2$  and gum arabic. Reduction proceeded rapidly on shaking with H, the concd. soln. yielding (a). An attempt to prep. the di-MeO homolog of (C) by condensing m-C $_6$ H $_4$ (OH) $_2$  with 3,4-(MeO) $_2$ C $_6$ H $_3$ CH $_2$ CH $_2$ CO $_2$ H (H) with



the corresponding pyranol anhydrochloride, *7-methoxy-2-phenyl-1,4-benzopyranol anhydrochloride*, was obtained by satg. 8 g. 2,4-HO(MeO) $C_6H_3$ CHO and 6 g. AcPh in 25 cc. HOAc with HCl gas for 1.5 hrs., pptg. more of the orange needles with Et<sub>2</sub>O; seps. from dil. HCl with 3 H<sub>2</sub>O, m. 102–3°, shows a blue-green, persistent fluorescence in aq. soln. (*L*) was treated in hot PhH with PhMgBr in Et<sub>2</sub>O until a test gave an intense blue-green color with an Et<sub>2</sub>O soln. of *p*-C<sub>6</sub>H<sub>4</sub>O<sub>2</sub>. After heating 10 min. on the H<sub>2</sub>O bath, cooling, and decompg. with H<sub>2</sub>O, the PhH soln. contained a substance which was probably the  $\alpha$ -pyranol (*V*) and was isolated as the *anhydroferrichloride* (*M*), orange needles from HOAc, m. 185°, by shaking with dil. HCl and adding concd. FeCl<sub>3</sub> soln. to the aq. layer. (*M*) is also obtained from 7-methoxyflavone and PhMgBr, through the carbinol base (*VI*), this indicating that the same anhydro-salt may correspond to 2 carbinol bases. (*M*) was also formed from 7-hydroxy-2,4-diphenyl-1,4-benzopyrano dimethyl ether (*N*), which loses MeOH when treated with acids. (*VI*) was prepd. by condensing Bz<sub>2</sub>CH<sub>2</sub> with *m*-MeOC<sub>6</sub>H<sub>4</sub>OH in H<sub>2</sub>SO<sub>4</sub>, but could not be freed from a portion that became demethylated in the synthesis. However, when (*N*) is dissolved in dil. HCl and the soln. treated with NaOAc, amorphous *7-methoxy-2,4-diphenyl-1,4-benzopyranol* (*VI*), is pptd., m. 55–7°; in Et<sub>2</sub>O with dry HCl it yields the *anhydrodihydrochloride*, yellow crystals with 2 H<sub>2</sub>O, m. 121°; when dissolved in hot dil. HCl the *anhydrohydrochloride* seps., red needles, m. about 80°; *anhydrochloroplatinate*, orange needles from the hot soln., m. 224°. Appendix II. Describes the synthesis of *7-hydroxy-4,3-indeno-1,2-benzopyrone* (*VII*), the 1st synthetic compd. containing the skeleton of braziliin and hematoxilin, with J. A. Prescott in 1911.



After frequent shaking during 2 hrs. CO<sub>2</sub> was passed through the soln. of the Na deriv. from 8.5 g.  $\alpha$ -hydrindone (*P*) and 6 g. NaNH<sub>2</sub> until most of the Et<sub>2</sub>O had evapd. After careful addition of ice the soln. was extd. twice with Et<sub>2</sub>O to remove unchanged (*P*), acidified with HCl, cooling with ice, and the ppt. quickly collected and dried on porous tile, 8 g. *1-hydrindone-2-carboxylic acid* being obtained, crystals, gives a red-violet color with FeCl<sub>3</sub>, slowly decomp. into (*P*) and CO<sub>2</sub> at room temp. or rapidly on warming with H<sub>2</sub>O; mixed with 9 g. *m*-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> and 100 cc. satd. HCl-MeOH, let stand 2.5 days, then heated 2 hrs. on the H<sub>2</sub>O bath and cooled, it gave 3 g. (*VII*), needles from alc., darkens about 230°, turns dark blue 280°, but does not m., fluoresces intensely blue-violet in H<sub>2</sub>SO<sub>4</sub>.

M. HEIDELBERGER.

**Trimorphic change of 4-nitroaceto-*o*-toluidide.** FREDERICK DANIEL CHATTAWAY: Oxford. *J. Chem. Soc.* 113, 897–9(1918).—In general anilides cryst. in 1 of 3 forms:  $\alpha$ , slender prismatic;  $\beta$ , compact; or  $\gamma$ , hair-like, and many have been obtained in 2 of these. 2,4-AcNH(O<sub>2</sub>N) $C_6H_3$ Me (*A*) (Nölting and Collin, *Ber.* 17, 269(1884)) can be obtained in all 3. From a soln. in boiling alc. the faintly yellow, bulky  $\alpha$ -form seps. as doubly refracting needles with straight extinction; if let stand in the mother liquor they gradually change to small, yellow, less voluminous, hexagonal monoclinic plates of the  $\beta$ -form, the change taking a few days when the vessel is undisturbed. Often before the transformation is complete the  $\gamma$ -form begins to appear as colorless tufts of minute, doubly refracting, hair-like crystals (extinction, 35°) until the whole contents of the vessel become a felted mass which is difficultly filterable. If the mass

of  $\alpha$ -form first sepg. is seeded with the  $\gamma$ -form direct transformation occurs without the  $\beta$ -form as intermediate stage. All 3 forms m.  $150-1^\circ$ . A detailed crystallographic report by T. V. Barker is appended.

M. HEIDELBERGER.

**Preparation of ethylamine and of diethylamine.** EMIL ALPHONSE WERNER. Trinity Coll., Dublin. *J. Chem. Soc.* 113, 899-902 (1918).—9 g.  $\text{EtNH}_2$  were added to 12 g.  $\text{Et}_2\text{NH}\cdot\text{HCl}$  in 30 cc. alc. and after 1 hr. all free amine was removed by distn. and converted into the HCl salt; this proved to be pure  $\text{Et}_2\text{NH}\cdot\text{HCl}$ . Similarly, 8 g.  $\text{Et}_2\text{NH}$ , added to 15 g.  $\text{Et}_2\text{N}\cdot\text{HCl}$  in 35 cc. alc. gave a distillate which yielded pure  $\text{Et}_2\text{N}\cdot\text{HCl}$ . It is thus seen that, contrary to the usually accepted view, the strength of the bases decreases in the order  $\text{EtNH}_2$ ,  $\text{Et}_2\text{NH}$ ,  $\text{Et}_2\text{N}$ . A fair sepn. of the 3 amines was obtained as follows: 4 g. NaOH were added to a soln. of 13.8 g.  $\text{Et}_2\text{N}\cdot\text{HCl}$ , 11 g.  $\text{Et}_2\text{NH}\cdot\text{HCl}$ , and 9 g.  $\text{EtNH}_2\cdot\text{HCl}$  in 60 cc.  $\text{H}_2\text{O}$ , the soln. was well shaken, and the liberated amine distd. off after 20 hrs., the distillate yielding practically pure  $\text{Et}_2\text{N}\cdot\text{HCl}$  (Cl, 26.04%). The remaining soln. was treated similarly after adding 4 g. more NaOH, the resulting salt (Cl, 34.44%) consisting of about 85%  $\text{Et}_2\text{NH}\cdot\text{HCl}$  and 15%  $\text{EtNH}_2\cdot\text{HCl}$ . The residual soln. was directly distd. after again adding NaOH, the liberated amine having the approx. compn.,  $\text{EtNH}_2$ , 75%;  $\text{Et}_2\text{NH}$ , 25%. Usually, in the prepn. of  $\text{EtNH}_2$  the entire amt. of  $\text{EtBr}$  used is added to the  $\text{NH}_3$  at once, but that this is an erroneous procedure is shown by the figures below, in which the mol. ratio  $\text{EtBr}:\text{NH}_3$  and the % yield  $\text{EtNH}_2$  are given, resp.: 1:1, 11.3; 1:4, 24.4; 1:6, 26.7; 1:8, 28.1; 1:16, 34.2. Based on the above expts., bearing in mind the relative tendency to "dissociation" of the resp. amine salts, the following procedure for the prepn. of  $\text{EtNH}_2$  was worked out: 5 l. 90% alc. were satd. with  $\text{NH}_3$  (cf. C. A. 13, 121) until 490 g. had been dissolved, 200 g.  $\text{EtBr}$  were added, and then, at intervals of 2 days, 180, 170, 150, 130, 110, 100, 80, and 66 g.  $\text{EtBr}$ , resp. On the 12th day  $\text{NH}_4\text{Br}$  began to sepd., and on the 16th day the prepn. was stopped. Alc. containing 10%  $\text{H}_2\text{O}$  was used since it was found that when much  $\text{NH}_4\text{Br}$  sepd. early in the process the subsequent formation of  $\text{Et}_2\text{N}$  was promoted. The  $\text{NH}_4\text{Br}$  was sepd. and the alc. soln. concd. by distn. (using the evolved  $\text{NH}_3$  to charge more alc.) until nearly all  $\text{NH}_4\text{Br}$  formed had sepd., 362 g. in all being obtained. The soln. of the amine hydrobromides was then distd. until the temp. reached  $130^\circ$  to remove all alc. If it is not convenient to liberate the entire amt. of mixed amines by addition of NaOH to the residue  $\text{CHCl}_3$  may be used for their sepn., 0.163 g.  $\text{EtNH}_2\cdot\text{HBr}$  dissolving in 100 cc. at  $14^\circ$ , while 42 g.  $\text{Et}_2\text{NH}\cdot\text{HBr}$  dissolve. In this way 465 g. pure  $\text{EtNH}_2\cdot\text{HBr}$  and 510 g.  $\text{Et}_2\text{NH}\cdot\text{HBr}$  containing a little more than 5%  $\text{Et}_2\text{N}\cdot\text{HBr}$  were obtained. After sepn. of  $\text{Et}_2\text{N}$  (14 g.) by the calcd. amt. NaOH, 226 g.  $\text{Et}_2\text{NH}$ , b.  $56-7.5^\circ$ , were obtained. It is thus seen that the amt. of  $\text{Et}_2\text{N}$  formed is practically negligible, whereas it has hitherto been the chief product of the reaction (Garner and Tyrer, C. A. 10, 1328).

M. HEIDELBERGER.

**A new synthetic method of passing from aliphatic to aromatic compounds.** TEL. KOMNINOS. Univ. Athens. *Compt. rend.* 167, 781-3 (1918); *Bull. soc. chim.* 23, 449-55 (1918).—To 28 g.  $\text{CH}_3(\text{COCl})$  and 11.5 g.  $\text{Me}_2\text{CO}$  was added 20 g.  $\text{CaCO}_3$ . A temp. elevation and vigorous evolution of  $\text{HCl}$  necessitated cooling the soln. More  $\text{Me}_2\text{CO}$  was added after the reaction had ceased. Upon standing brilliant vermilion crystals sepd. The  $\text{CaCO}_3$ , filtered off, washed with  $\text{Me}_2\text{CO}$ , and dried, weighed 15 g. though theoretically 10 g. should have been used up by the reaction. The crystals washed with  $\text{Me}_2\text{CO}$ , alc., then  $\text{Et}_2\text{O}$ , and dried, weighed 14 g. The filtrate was made alk., evapd. to dryness and the residue taken up in boiling abs. alc. and evapd. to dryness. This was repeated, using  $\text{H}_2\text{O}$ . After treating with  $\text{Et}_2\text{O}$ , 1 g. of crystals was obtained, m. p.  $217^\circ$ , identical with that of phloroglucinol. The vermilion crystals (decomp.  $160^\circ$ ) are sol. in  $\text{Me}_2\text{CO}$ , insol. in  $\text{Et}_2\text{O}$  and alc., and the hot  $\text{H}_2\text{O}$  soln. contains Cl but gives no phloroglucinol reaction. The formula  $\text{ClCOCH}_2\text{COCH}_2\text{COME}$

(Cl obtained, 21.8%; theory, 21.84%) represents this compd. and explains why only 1 mol. of HCl was liberated in the primary reaction. To transform this compd. into phloroglucinol, 5 g. in  $H_2O$  was heated with 5 g.  $CaCO_3$  on a boiling  $H_2O$  bath.  $CO_2$  was liberated and the  $CaCO_3$  loss, detd. as before, was 1.5 g., corresponding to 1 mol. HCl. From the yellow filtrate about 4 g.  $C_6H_4O_3$ , m.  $217^\circ$ , was obtained by crystn. from  $Et_2O$ . The two compds. produced by this synthesis are  $ClCOCH_2COCH_2COMe$  and  $C_6H_4O_3$ , the former produced by a secondary reaction but being easily converted into the latter by loss of HCl. The compn. of phloroglucinol as a tautomeric compd. is confirmed. A review is given of the methods of passing from the aliphatic to the aromatic series.

C. H. KIDWELL.

**Phenols.** The fusion of sodium hydroxide with several phenols and sulfonic acids. MAITLAND C. BOSWELL AND J. V. DICKSON. Univ. Toronto. *J. Am. Chem. Soc.* 40, 1786-93 (1918).—Following up a previously advanced hypothesis (*C. A.* 13, 98), that in fusions of NaOH with certain salts oxidations occur whose mechanism would consist of a decompn. of  $H_2O$ , fusions of NaOH were made with the Na salts of  $PhSO_3H$ ,  $\beta$ - $C_{10}H_7SO_3H$ , anthraquinone- $\beta$ -monosulfonic acid, phenylglycine- $o$ -carboxylic acid and of the 7 phenols, carboic acid, quinol, pyrocatechol, resorcinol, pyrogallol, hydroxyquinol and phloroglucinol. Fusions were carried out both with access to the air and in an atm. of N. From a table given showing analytical results of the gases formed during the reactions, it is seen that the proportion of  $O_2$  used up to  $H_2$  produced is approx. 1:2. The yield of PhOH by fusion of  $PhSO_3Na$  with NaOH was increased from 90.6% to 99% by carrying out the fusion and cooling of the melt in an atm. free from gaseous  $O_2$ . When free  $O_2$  was present secondary reactions occurred, involving first an absorption of free  $O_2$  followed by an oxidation involving the elements of  $H_2O$ , free  $H_2$  being evolved. None of the 6 di- and trihydroxybenzenes were the direct cause of this  $H_2$  evolution.  $PhONa$  and  $NaHSO_3$ , products in the sulfonate fusion, were practically unacted on by NaOH. Oxidation of the 3 dihydroxybenzenes and of pyrogallol by NaOH occurred in the presence of free  $O_2$  but oxidation by reaction with  $H_2O$  catalyzed by NaOH was not observed in this case nor in the fusion of  $\beta$ - $C_{10}H_7SO_3Na$  or Na phenylglycine- $o$ -carboxylate with NaOH. In the fusion of Na anthraquinone- $\beta$ -monosulfonate, oxidation occurs by means of the  $H_2O$  reaction without necessity of previous oxidation by free  $O_2$ .

C. H. KIDWELL.

Some ketones of camphor. HANS RUPE, MARKUS WERDER and KUNHIKO TOKAGI. *Helvetica chim. acta* 1, 309-42 (1918).—Camphorylidene-3-acetone (A),  $C_9H_{14}.CO.C:CHAc$ , was prepd. by allowing the camphorylidene-3-acetyl chloride to

react with  $CHNaCO_2Et_3$ , obtaining first the intermediate compd. diethyl di[camphorylidene-3-acetyl]malonate (B), yellow needles, m.  $90-1^\circ$ , from which (A) was obtained by hydrolysis in AcOH with 30%  $H_2SO_4$ . (A) is a yellow liquid,  $b_{10}$   $137-8^\circ$ ,  $d_4^{20}$  1.0327. Several derivs. of (A) were prepd. Benzylidene-camphorylidene-3-acetone, m.  $94-5^\circ$ ; *p*-nitrobenzylidene-camphorylidene-3-acetone, small yellow crystals, m.  $150-1^\circ$ ; an oxime, white needles, m.  $142-3^\circ$ ; a phenylhydrazone, orange needles, m.  $145-6^\circ$ ; an hydrazine deriv. of camphorylidene-3-acetone, long, yellow needles, m.  $112-3^\circ$ ; a semicarbazone, prismatic needles which decomp.  $223-4^\circ$ . Repeated attempts were made to regenerate (A) from its semicarbazone but were not successful. No  $NaHSO_3$  compd. of (A) could be obtained. A second ketone, camphoryl-3-acetone  $C_9H_{14}.CO.CHCH_2Ac$

(C), a reduction product of (A), was also obtained through the malonic ester syntheses. Instead, however, of using camphorylidene-3-acetyl chloride, as in the prepn. of (A), camphoryl-3-acetyl chloride was used. (C) is a yellow oil  $b_{12}$   $150-1^\circ$ . However, when regenerated from its semicarbazone it is an odorless oil, of bitter taste,  $b_{12}$   $148.5-9^\circ$ ,



$d_{40}^{20}$  1.0213. Several derivs. of this ketone were prepd.: *Benzal-camphoryl-3-acetone*, white plates, m. 75–6; a *semicarbazone*, long, colorless needles, m. 203–4°; a *phenylhydrazone*, colorless needles, m. 87–9°. (C) also forms a compd. with acetophenone, namely, *camphoryl-3-acetophenone* (D),  $C_{18}H_{24}.CO.CHCH_3.COCH_2.Bz$ . This was puri-

fied through its Cu salt, which seps. out as light green crystals, m. 184–6°. (D) crysts. out in the form of prisms, m. 59–61°. In connection with the prepn. of (A) and (C) the following new compds. were prepd.: *Camphorylidene-3-acetyl chloride*, colorless needles, m. 34–5°; *camphorylidene-3-acetic acid hydrobromide*, colorless needles, m. 153–4° (decompn.); a *bromine derivative of camphorylidene-3-acetic acid*, colorless needles, m. 73–5°; *ethyl camphorylidene-3-acetate*, yellow oil, odorless,  $b_{12}$  149.5–50°,  $d_{40}^{20}$  1.0459; *camphoryl-3-acetic acid*, oil,  $b_{12}$  191.5–2.5°, which crysts. on standing, m. 83–4°; *ethyl camphoryl-3-acetate*, oil,  $b_{12}$  154–5°; *anhydride of camphoryl-3-acetic acid and acetic acid*  $C_8H_{14}.CO.CHCH_3.COOAc$ , colorless needles, m. 118–20°; *ethyl di-[camphorylidene-3-*

*acetyl]acetate*, colorless, needles, m. 149–50°. An improved method for the prepn. of *camphorylidene-3-acetic acid* (cf. *Ann.* 281, 387) is described. MAX PHILLIPS.

**Direct transformation of acid chlorides into nitriles by means of a catalyzer.** ALPH. MAILHE. *Bull. soc. chim.* 23, 380–1 (1918).—A simple method for directly converting an acid chloride into its corresponding nitrile consists in passing the vapors of the acid chloride and gaseous  $NH_3$  over  $Al_2O_3$  heated to 490–500°.  $BzCl$  when thus heated yields  $PhCN$ , b. 188–90°; isovaleryl chloride gives isovaleronitrile, b. 128–9°; isobutyryl chloride and propionyl chloride yield their corresponding nitriles, b. 108° and 92°, resp. MAX PHILLIPS.

**Alkaloids of the pomegranate tree. V. Separation of pelletierine and methylisopelletierine into their optical isomers. Explanation of Tanret bases.** KURT HESS AND ANNALIESE EICHEL. *Ber.* 51, 741–7 (1918); cf. *C. A.* 12, 1186.—The authors mention the previous works on the constitution of pelletierine (a) and methylisopelletierine (b). Both are optically inactive. Tanret described two optically active varieties of identical compn. H. and E. believed that these varieties were the optical isomers of (a) and (b). Tanret found  $[\alpha]_D -30^\circ$  (sulfate) for the isomer of (a) and  $[\alpha]_D 23^\circ$  (hydrochloride) for the isomer of (b). (a) is easily sepd. through the bitartrate. *d*-Pelletierine *d*-tartrate shows  $[\alpha]_{\text{Gaslight}}^{21}$  19.50 and *l*-pelletierine *l*-tartrate  $[\alpha]_{\text{Gaslight}}^{20} -19.62^\circ$ . In the prepn. of the free optically active bases from these salts a rapid racemization was observed when these salts were decompd. with alkalis at 0° and distd. *in vacuo*. The authors established that this racemization was the result not of the action of the alkalis but of the distn. When the bitartrate was treated with alkali according to the method above mentioned, then shaken with ether and treated with  $H_2SO_4$  the aq. soln. contained the corresponding optically active bases and the following results were obtained: *d*-Pelletierine sulfate gave  $[\alpha]_{\text{Gaslight}}^{18}$  5.39°, and *l*-pelletierine sulfate  $[\alpha]_{\text{Gaslight}}^{18} -5.33^\circ$ . In comparison with T.'s results for "optically active pelletierine"  $[\alpha]_D -30^\circ$  (sulfate), it is concluded that no *l*-pelletierine exists in the optically active substance of Tanret. (b) gives for *d*-methylisopelletierine *d*-bitartrate  $[\alpha]_{\text{Gaslight}}^{20}$  19.15°, and for *l*-methylisopelletierine *l*-bitartrate  $[\alpha]_{\text{Gaslight}}^{18} -19.37^\circ$ . For the sulfate of the active base  $[\alpha]_{\text{Gaslight}}^{18}$  6.71° and  $[\alpha]_{\text{Gaslight}}^{18} -6.70^\circ$ . For the hydrochloride  $[\alpha]_{\text{Gaslight}}^{18}$  9.90° and  $[\alpha]_{\text{Gaslight}}^{18} -9.69^\circ$ . The comparison with  $[\alpha]_D 23^\circ$  (hydrochloride) given by Tanret shows that Tanret's substance is quite different from (b). The authors observe also that the optically active forms of their bases do not exist in *Punica granatum*. Contrary to (a), the optically active forms of (b) do not racemize during distn. and the O atom in the

neighborhood of the asym. C atom of (b), differing from the *o*-atom in the  $\gamma$ -position of (a), has no influence on the asym. C atom. MARCEL J. SIMONET.

**Cleavage of digitonin cholesteride.** A. WINDAUS. *Z. physiol. Chem.* 101, 276-7; *J. Chem. Soc.* 114, II, 336; cf. Lifschütz, *C. A.* 12, 2086.—W. gives further details of the method for the prepn. of cholesteryl acetate from digitonin cholesteride, but points out that the cleavage is more readily accomplished by the action of hot xylene (cf. *C. A.* 4, 2311) or by one of the more recent methods, involving the use of  $\text{Ac}_2\text{O}$ . Cf. Prescher, *C. A.* 12, 97. C. J. WEST.

**Determination of the configuration of cis-trans isomeric substances.** J. BÖRSEKEN AND C. VAN LOON. *Proc. Acad. Sci. Amsterdam* 21, 80-9 (1918).—A translation into English of the paper abstracted in *C. A.* 12, 2545. E. H.

**Addition of hydrogen bromide to allyl bromide.** A. F. HOLLEMAN AND B. F. H. J. MATHES. *Proc. Acad. Sci. Amsterdam* 21, 90-1 (1918).—A translation into English of the paper abstracted in *C. A.* 12, 2545. E. H.

**Xanthic acids and the kinetics of their decomposition** (VON HALBAN, HECHT) 2. **Constituents of resins** (LIEB, ZINKER) 26. **Preparation and properties of aniline chlorostannate** (DRUCKER) 6.

**Chlorinating methane.** B. S. LACY. U. S. 1,286,353, Dec. 3.  $\text{Cl}$  is mixed with 5 times its vol. of  $\text{CH}_4$  at ordinary temp. and 10 volumes of  $\text{CH}_4$  separately heated to  $370^\circ$  and mixed with the cold  $\text{Cl-CH}_4$  mixt. and reaction is effected at a temp. of about  $450^\circ$  in a vessel of  $\text{Cl}$ -resisting material protected against loss of heat by radiation. This procedure effects the production of  $\text{CH}_2\text{Cl}$  with a smaller amt. of  $\text{CH}_2\text{Cl}_2$ .

**Acetic acid.** H. DREYFUS. U. S. 1,286,255, Dec. 3.  $\text{HOAc}$  is made by passing a mixt. of acetaldehyde with  $\text{O}$  or air over a catalyst such as platinized asbestos at a temp. between the b. p. of  $\text{HOAc}$  and  $400^\circ$ . U. S. 1,286,256 specifies conducting the same process within a temp. range of  $150$ – $250^\circ$ , which gives best yields. Preferably the temp. is held at  $150$ – $200^\circ$ .  $\text{Cu}$  or oxides of  $\text{Cu}$  or  $\text{Cr}$  also may be used as catalyst.

**Acetic acid from acetaldehyde.** BADISCHE. Ger. 296,282, addition to 294,724, 1917 (*C. A.* 11, 2580). Instead of  $\text{Fe}$  compds., such substances as  $\text{Ni}(\text{OAc})_2$  or animal charcoal may be used as catalysts.

**Aromatic stibinic acids.** CHEM. FABRIK VON HEYDEN, AKT.-GES. Ger. 296,940; with 261,825 and 269,255, addition to 254,421, 1917. Nitro derivs. of aromatic stibinic acids are prepd. by treating diazotized nitroamines with antimonites or antimonious acid, in acid or neutral solns., at low temps.  $\text{Sb}_2\text{O}_3$  dissolved in such an acid as tartaric acid is recommended, and  $\text{Cu}$  powder is often useful as a catalyst. 2-Nitro- and 2,4-dinitrophenylstibinic acids are brown powders which explode on heating. 3-Nitro-*p*-anilinoarsonic acid yields 2-nitro-4-arsonophenylstibinic acid,  $\text{AsO}_2\text{H}_2\cdot\text{C}_6\text{H}_4(\text{NO}_2)\cdot\text{SbO}_2\text{H}_2$ , which is a similar brown powder.

**Halogenated arsonic acids.** BAYER & Co. Ger. 296,915, 1917. Hydrocarbons of the acetylene series are treated with  $\text{As}$  trihalides, or mixts. which yield these compds. and the products are converted into arsenoxides and then into arsonic acids by oxidation. Thus, heptinene gives "heptinenechloroarsenoxide," a dark sirup, and "heptinenechloroarsenic acid" ( $\text{C}_6\text{H}_{11}\cdot\text{CCl}:\text{CH}\cdot\text{AsO}(\text{OH})_2$ ), white needles, m.  $115^\circ$ , the Na salt of which is freely sol. in  $\text{H}_2\text{O}$ . Octinene yields "octinenebromoarsenoxide" and "octinenebromoarsenic acid," m.  $129$ – $30^\circ$ .

**6-Amino-3-sulfobenzoic acid.** BAYER & Co. Ger. 296,941, 1917. Anthranilic acid is directly sulfonated by means of chlorosulfonic acid in an indifferent solvent, such as nitrobenzene, dichlorobenzene, or petroleum.

***ω*-Dihalo-*p*-toluyl-*o*-benzoic acid.** CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger. 297,018, 1917. When 2-*p*-toluylbenzoic acid is treated with Br at a high temp., it is smoothly converted into 2-*ω*-dibromo-*p*-toluylbenzoic acid (4-dibromomethyl-2'-carboxybenzophenone), a white powder, valuable as a source of anthraquinone derivs., which changes into 4-aldehydo-2'-carboxybenzophenone (2-*p*-aldehydobenzoylbenzoic acid) on heating with dil. alkali hydroxide.

**Crystalline ester of the diiodide of ricinistearolic acid.** J. D. RIEDEL. Ger. 303,052, 1914. Et ricinistearolate diiodide, colorless needles, m. 31°, can be obtained by esterifying the diiodide of ricinistearolic acid or by the addition of I to Et ricinistearolate.

**Single or mixed anhydrides of monobasic carboxylic acids.** NAAMLOOZE VENNOOTSCHAP FABRIEK VAN CHEM. PRODUCTEN. Holl. 2,484, May 15, 1918. Anhydrous alkali or alk.-earth salts of sulfuric and carboxylic acids are heated, alone or in the presence of an indifferent liquid, and the single acid anhydride is distd. off.

**Dialdehydesulfoxylic acids.** A. BINZ. Ger. 303,478, 1916. Diformaldehydesulfoxylic acid,  $S(OCH_2OH)_2$ , can be obtained from a formaldehydesulfoxylate, formaldehyde soln., and alc. HCl; similarly, dibenzaldehydesulfoxylic acid is obtainable from benzaldehydesulfoxylate. The analogous formaldehydebenzaldehydesulfoxylic acid,  $HOCH_2OSOCHPhOH$ , reacts with *p*-toluidine, yielding the substance  $MeC_6H_4NHCH_2OSOCHPhOH$ .

***p*-Cymenesulfonic acid.** RHEINISCHE CAMPHER-FABRIK. Ger. 303,095, 1916. 2-Bromo-*p*-cymene-3-sulfonic acid can be conveniently reduced by heating with ordinary or activated Zn and NaOH soln.

**Tropic acid.** CHEM. WERKE GRENZACH. Ger. 302,737, 1917. Ethylhydroxy-methylenphenylacetate is reduced to Et tropate and hydrolyzed, the resulting tropic acid being identical with the product obtained from atropine.

**Aromatic selenium compounds.** FARBW. VORM. M. L. & B. Ger. 299,510, 1917. Organic Se compds. can be prep'd. by treating such substances as aniline, acetanilide, phenol, salicylic acid, and nitrophenol with a soln. of Se or  $SeO_2$  in  $H_2SO_4$  at low temp. The product from acetanilide forms colorless crystals, m. approx. 260°; colorless products were also obtained from phenol, salicylic acid, and resorcinolarsonic acid, whereas aniline sulfate yielded an almost black powder and *o*- and *p*-nitrophenols yellow products. The compd., needles, m. 260° (with decompn.), produced from *p*-acetylaminophenetidine had the compn.  $(EtOC_6H_4NHAc)_2SeSO_4 \cdot H_2O$ , while anti-pyrine yielded a *diantipyril selenide*,  $(C_{11}H_{11}ON)_2Se$ , colorless needles, m. 240° (with decompn.).

**Organic compounds containing phosphorus.** J. D. RIEDEL. Ger. 299,992, 1917. Unsatd. hydroxy fatty acids of high mol. wt. on treatment with P trihalides or oxyhalides yield as primary products acid halides in which the OH group is intact; on hydrolysis of these products with  $H_2O$ , P derivs. of the hydroxy acids are obtained which may be converted into the salts of the alk.-earth metals in the usual way. Ricinistearolic acid and ricinolic acid on treatment with  $PCl_3$  or  $PBr_3$  yield compds.  $C_{18}H_{33}O_4P$  and  $C_{18}H_{31}O_4P$ , resp.

**Derivatives of the 9,10-dichloroanthracenes.** FARBW. VORM. M. L. & B. Ger. 296,019, 1917. The 9,10-dichloroanthracenes combine directly with  $HNO_3$  in indifferent, cold media, giving well-defined, cryst. products, probably of the constitution

$$C_6H_4 \begin{array}{c} \diagup CCl(OH) \diagdown \\ \diagdown CCl(NO_2) \diagup \end{array} C_6H_4$$
 These decompose most readily, especially on warming with concd.  $H_2SO_4$ , or organic solvents or diluents, giving anthraquinones. Thus,

9,10-dichloroanthracene itself gives the additive compd., specified above, which crystallizes in very pale yellow needles, and decomposes at  $90-5^{\circ}$  into anthraquinone. 2,9,10-Trichloroanthracene yields a similar  $\text{HNO}_3$  compd., which gives 2-chloro-anthraquinone, m.  $204-6^{\circ}$ , on decompn.

**Aryl sulfites.** BADISCHE. Ger. 303,033, 1916. Aromatic sulfites are obtainable by treating aromatic OH compds. with thionyl chloride in the presence of pyridine or other suitable organic bases; the hydroxy acids do not show this behavior. *Phenyl sulfite*,  $b_{12}$   $185^{\circ}$  (in H), *o-tolyl sulfite*,  $b_{12}$   $192^{\circ}$  (corr.), *m-tolyl sulfite*,  $b_{12}$   $195-6^{\circ}$  (corr.), and *p-tolyl sulfite*,  $b_{12}$   $199^{\circ}$  (corr.), were obtained by the interaction of phenol or the cresol with thionyl chloride in the presence of pyridine and  $\text{CS}_2$ ; they are very stable towards  $\text{H}_2\text{O}$  and aq. alkalis, whereas some of their homologs, especially such as contain negative groups, readily undergo decompn. The following compds. of this type were also prepd.: *thymyl sulfite*;  $\alpha$ -*naphthylsulfite*, indistinct crystals, m.  $92-3^{\circ}$ ;  $\beta$ -*naphthyl sulfite*, nacreous powder, sensitive to  $\text{H}_2\text{O}$ ; *p-chlorophenyl sulfite*,  $b_{12}$   $213-4^{\circ}$ , solidifiable to a cryst. solid.

**Condensation products of isatin and ketones.** CHEM. FABRIK AUF AKTIEN (VORM. E. SCHERING). Ger. 301,591, 1918. Condensation products, of unexplained nature, are obtained by mixing acetophenone or its derivs. with isatin and  $\text{NH}_3$  soln. Acetophenone itself gives pale yellow products,  $\text{C}_{16}\text{H}_{12}\text{O}_3\text{N}$  (?), m.  $152-3^{\circ}$ ; *p*-tolyl Me ketone yields a white product, m.  $165-7^{\circ}$ ; deoxybenzoin forms a product, m.  $147^{\circ}$ ; and the product from 3-nitro-4-hydroxyacetophenone forms yellow crystals, m.  $191^{\circ}$ .

**Condensation products from aromatic hydroxysulfonic acids.** BADISCHE. Ger. 301,451, addition to 300,567, 1917. Phenolic mono- or di-acids are condensed with aromatic hydroxysulfonic acids, or with aromatic hydroxy compds. followed by sulfonation of the products. E. g.,  $\beta$ -naphthol-6-sulfonic acid is condensed with *p*-homosaligenin, *p*-cresol with *p*-cresol dialc. (the product m.  $215^{\circ}$ ), and 2-chloro- $\alpha$ -naphthol with *p*-homosaligenin and dihydroxyditolylmethane (m.  $126^{\circ}$ ; from HCO and *p*-cresol).

**Carbamic esters and their *N*-alkyl derivatives, and carbonic esters.** BAYER & Co. Ger. 296,889, 1917. Homologs of phenol, except the cresols, are converted into carbonates or carbamates in the usual way. The products are odorless and tasteless, and have anthelmintic properties. Thus, *p*-tert.-butylphenol reacts with  $\text{COCl}_2$  to form *p*-tert.-butylphenyl carbonate,  $\text{CO}(\text{OC}_6\text{H}_4\text{CMe}_3)_2$ , m.  $108^{\circ}$ , in the presence of pyridine, and *p*-tert.-butylphenyl *N*-dimethylcarbamate,  $\text{NMe}_2\text{CO}_2\text{C}_6\text{H}_4\text{CMe}_3$ , m.  $92^{\circ}$ , in the presence of dimethylamine, while the corresponding carbonate crystallizes in platelets or needles, m.  $123-4^{\circ}$ . *p*-Isoamylphenyl carbamate, m.  $73-4^{\circ}$ , *p*-benzylphenyl carbamate, m.  $144^{\circ}$ , *p*-isopropylphenyl carbamate, m.  $93-5^{\circ}$ , and *o*-allylphenyl carbamate, m.  $122-3^{\circ}$ .

**Derivative of hexamethylenetetramine.** LEO EGGER. Ger. 303,450, 1915. Hexamethylenetetramine acetylsalicylate, m.  $118-9^{\circ}$ , is prepd. by the gradual addition of  $(\text{CH}_2)_6\text{N}_4$  (1 mol.) to a soln. of acetylsalicylic acid (1 mol.) in a restricted vol. of ether.

**Tertiary amines.** O. MATTER. Ger. 301,450 and 301,832, 1918. Cl derivs. of the hydrocarbons are heated with sodamide, the mixt. being stirred, and, if necessary, agents like Cu gauze or Cu powder being employed as catalysts. Thus, chlorobenzene yields triphenylamine, benzyl chloride at  $110-20^{\circ}$  gives tribenzylamine, and isoamyl chloride at  $210-20^{\circ}$  forms tri-isoamylamine. Mixts. of the Cl compd. and a primary amine may also be heated with sodamide, when, if the amine contains a different radical, a mixed tert.-amine results. Thus, benzyl chloride, benzylamine, and sodamide, at

100–10°, yield tribenzylamine, benzyl chloride and aniline produce dibenzylaniline, and benzyl chloride and *p*-toluidine give dibenzyl-*p*-toluidine.

**Alkylselenocarbamides.** CHEM. FABRIK VON HEYDEN. Ger. 305,262, 1918. Alkylselenocarbamides are prepd. by the action of  $H_2Se$  on alkylcyanamides. The substances have a therapeutic value in the treatment of cancerous disease, and serve as intermediate products in the production of the more stable alkyl halide additive compds. Alkylselenocarbamide forms almost colorless needles, m. 93°, which become superficially red owing to the sepn. of Se; it unites with Br and I and reduces alk. permanganate. It is very sensitive to air and light. The Hg and Pb salts eliminate Se. Ethylselenocarbamide forms colorless needles, m. about 125°.

**Derivatives of alkylselenocarbamides.** CHEM. FABRIK VON HEYDEN. Ger. 205,263, 1918. The alkylselenocarbamides combine readily with alkyl halides to yield compds. in which the Se is more firmly combined than in the parent selenocarbamides; they are more stable towards light and more sol. in  $H_2O$ . Their compn. is probably expressed by the formula  $Alk.NH.C(NH_2):SeI.Alk$ . The compd. formed from allylselenocarbamide and EtI forms white leaflets, m. about 100°; the I is pptd. as AgI by  $AgNO_3$ . The Se is not pptd. as Pb or Hg selenide by Pb or Hg salts, as in the case of allylselenocarbamide. The compd. from ethylselenocarbamide and allyl bromide, m. 115°.

**Hydrogenated compounds.** BAYER & Co. Ger. 305,347, 1918. The process depends on the action of alkali or alk.-earth metals and alcs. on isocyclic or heterocyclic bases in the presence of an inert solvent; the alc. is preferably added at the same rate as it is used in the reaction. Thus tetrahydro- $\alpha$ -naphthylamine is formed when a soln. of  $\alpha$ -naphthylamine in alc. is added to a mixt. of solvent naphtha and Na at a temp. above 130°; with a solvent of lower b. p., such as toluene, dihydro- $\alpha$ -naphthylamine is obtained. 2-Methylquinoline when hydrogenated at above 130°, yields tetrahydro-2-methylquinoline, which gives a characteristic blood-red coloration with  $FeCl_3$  and  $K_3Fe(CN)_6$ . The picrate, m. 153–4°.

**Trialkylethanolarsonium hydroxides and their salts.** CHEM. WERKE GRENZACH. Ger. 303,032, 1916. By hydrolysis of haloethyltrialkylarsonium halides with  $H_2O$  at higher temps., it is possible to produce arsonium compds, analogous to choline, and having valuable therapeutic properties. Trimethylarsine and ethylene bromide react at 100–5°, yielding *trimethyl- $\beta$ -bromoethylarsonium bromide*, prismatic tablets, m. 239° (corresponding *picrate*, m. 189°), which is converted by  $H_2O$  at 180° into *trimethyl- $\alpha$ -ethanolarsonium bromide*,  $C_4H_9OBrAs$ , deliquescent prisms, m. 219°. *Triethyl- $\beta$ -bromoethylarsonium bromide*, m. 225°, obtained from  $AsEt_3$  and  $C_2H_4Br_2$ , on treatment with  $H_2O$  at 180°, yields *triethylethanolarsonium bromide*, needles.

**Guaiacol.** E. H. ZOLLINGER and H. RÖHLING. Ger. 305,281, 1918. A weak base such as  $Na_2CO_3$  or  $NaHCO_3$  is gradually added to a mixt. of catechol with the alkali or alk.-earth salts of methylsulfuric acid in the presence of veratrole as diluent at 160–80°; the yield is more than 85% of that theoretically possible.

**Homologs of emetine.** FARBW. VORM. M. L. & B. Ger. 301,498, 1918. Cephaeline is converted into its Et, propyl, and benzyl ethers.

**Paraffins.** BAYER & Co. Ger. 296,741, 1917. Alcs. are converted into their formates, and these are heated. Thus, dihydrocholesteryl formate, narrow tablets, m. 84°, when heated at 290° under 100 mm. pressure, yields cholestane, and myricyl alc. gives triacontane. The products are purified by mixing the ethereal soln. with  $AcOAc$  and concd.  $H_2SO_4$ , and evapg. the ether, when the pure hydrocarbons sep.

## II. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

**Connection of diastase, peroxidase and catalase.** H. MAGGI. Univ. Berne. *Helvetica chim. acta* 1, 433-51 (1918).—HCHO can function as a catalase, a peroxidase, and a diastase. The diastatic activity was shown by a study of the behavior of starch plus HCHO using the capillarization method, and by other expts. The aldehyde group may combine with  $H_2O_2$  to form a peroxide  $-CH(OH)(O-OH)$  which may react (a) with an excess of  $H_2O_2$  to liberate mol. O (catalase action), or (b) with a chromogen to form a pigment (peroxidase action). The aldehyde group may combine with water to form an unstable glycol  $-CH(OH)_2$ ; this decomposes with the liberation of H and OH which attack the starch substrate and hydrolyze it (diastase action) before they reunite to form water. Diastase may be considered as a complex radical  $R_F$  combined with an aldehyde (CHO) group. Study was also made of the development of a blue color in soln. containing I and starch-cleavage products and possessing a red color. It was concluded that unchanged starch must be present as well as a substance capable of liberating I. JOSEPH S. HERBURN.

**Amphoteric colloids. I. Chemical influence of the hydrogen-ion concentration.** J. LOEB. *J. Gen. Physiol.* 1, 39-60 (1918); cf. following abstract.—Gelatin which has been treated with NaOH and then washed free from excess alkali is influenced only by the cation of an added salt, e. g.,  $M/128 Na_2SO_4$  has the same effect in causing increased osmotic pressure, viscosity, alc. pptn. and swelling as  $M/64 NaCl$  has, or any neutral salt with monovalent cation, while salts with bivalent cations cause no such increase and if added in small quantity to a salt of a univalent cation may inhibit the effect of the univalent cation. Gelatin treated with HCl and then freed from excess by washing reacts only with the anion of neutral salts,  $M/128 Ca(NO_3)_2$  having the same effect as  $M/64 NaNO_3$ , and the Ca has no depressing effect, showing that the gelatin does not react with the cation. Bivalent anions inhibit the effect of monovalent anions. By making use of the depressing effects of bivalent ions and the opposite effect of univalent ions it can be detd. at which  $p_H$  the gelatin begins to combine with the cation and ceases to combine with the anion. This critical point lies at  $C_H = 2 \cdot 10^{-8}$  or  $p_H = 4.7$  which is the isoelectric point for gelatin, and gelatin when it ionizes can only exist as an ion on the less acid side of the isoelectric point ( $p_H = 4.7$ ), as a cation only on the more acid side of its isoelectric point. When gelatin has been transformed into sodium gelatinate by treating it for some time with  $M/32 NaOH$  and is then subsequently treated with HCl it shows, on the more acid side of the isoelectric point, effects of the acid treatment only, while the effects of the alkali treatment disappear completely, showing that the negative gelatin ions formed by the previous treatment with alkali can no longer exist in a soln. with a  $p_H = 4.7$ . When gelatin is first treated with acid and afterward with alkali on the alkaline side of the isoelectric point only the effects of the alkali treatment are noticeable. On the acid side of the isoelectric point amphoteric electrolytes can only combine with the anions of neutral salts, on the less acid side of their isoelectric point only with cations, and at the isoelectric point neither with the anion nor cation of a neutral salt. The alleged effect of the Hofmeister series of anions on the swelling and osmotic pressure of common gelatin in neutral soln. would mean, if true, that the anions of the neutral salts act on gelatin on the alkaline side of the isoelectric point. These statements are contrary to fact and are based on erroneous methods of work, and are also according to the present paper theoretically impossible. Cond. measurements confirm the conclusion

that gelatin cannot exist in ionized condition at the isoelectric point. Curves for osmotic pressure, viscosity, swelling and alcohol number run parallel to the cond. curve when the gelatin has been treated with acid, supporting the view that these physical properties are a function of the degree of ionization of the gelatin, although certain constitutional factors may alter the physical properties of the gelatin. The isoelectric point of an amphoteric electrolyte is a turning point for the physical properties and for the mode of chemical reactions of the ampholyte. This chemical influence of the isoelectric point upon life phenomena may overshadow its physical influence. The theory of amphoteric colloids is in its general features identical with the theory of inorganic hydroxides as  $\text{Al}(\text{OH})_3$ , whose behavior is adequately understood on the basis of the laws of general chemistry.

H. I. MATTILL.

**Amphoteric colloids. II. Volumetric analysis of ion-protein compounds; the significance of the isoelectric point for the purification of amphoteric colloids.** JACQUES LOEB. Rockefeller Inst. *J. Gen. Physiol.* 1, 237-54(1918); cf. preceding abstract.—At its isoelectric point,  $p_H$  4.7, gelatin combines with neither anion nor cation; on the alk. side of this point it combines only with cations, on the more acid side only with anions; therefore gelatin exists only as an anion on the alk. side, and only as a cation on the more acid side of the isoelectric point, and as neither an anion nor a cation at that point. The simplest method of obtaining amphoteric colloids approx. free from ionogenic impurities probably consists in bringing them to the H-ion concn. characteristic of their isoelectric point. When gelatin is combined with a monovalent ion (Ag, Br, CNS) the curve, which represents the amt. of ion-gelatin formed, runs approx. parallel to those for swelling, osmotic pressure, and viscosity. "The influence of ions on these properties is detd. by the chem. or stoichiometrical and not by the 'colloidal' condition of gelatin." These curves and the soly. of pure gelatin in  $\text{H}_2\text{O}$  drop sharply at the isoelectric point, and a ppt. forms; the decrease in soly. may be due to lack of ionization or to formation of an automeric or polymeric compd. of gelatin. "On account of this sudden drop slight changes in the H-ion concn. have a considerably greater chem. and physical effect in the neighborhood of the isoelectric point than at some distance from this point. This fact may be of biological significance since a number of amphoteric colloids in the body seem to have their isoelectric point inside the range of the normal variation of the H-ion concn. of blood, lymph, or cell sap. Our expts. show that while a slight change in the H-ion concn. increases the water soly. of gelatin near the isoelectric point, no increase in the soly. can be produced by treating gelatin at the isoelectric point with any other kind of monovalent or polyvalent ion, a fact apparently not in harmony with the adsorption theory of colloids, but in harmony with a chem. conception of proteins."

JOSEPH S. HEPBURN.

**Effect of "ground glass" on the gastro-intestinal tract of dogs.** JAMES S. SIMMONS AND WM. C. VON GLAHN. U. S. Army. *J. Am. Med. Assoc.* 71, 2127-8(1918).—Of 120 samples of food received at the Southern Dept. Lab., Fort Sam Houston, Texas, glass was found in 8. In a majority of these it could have been accidental and in a few it had evidently been added by those sending specimens. In an attempt to det. what lesions, if any, are produced by glass in the gastrointestinal tract, feeding expts. were carried out on 10 dogs. Daily records were made of the general appearance, wt., temp., blood count, and feces examn. (gross and microscopic) for blood, pus, epithelium, etc. At the completion of the expts. the dogs were chloroformed and examd. post-mortem. Broken chem. glassware was ground in a stone mortar and the product divided into 5 sizes by sieves. The dogs were divided into two series of five dogs each and given doses of 1 and 5 g. of each size, resp., the glass being mixed with lean meat. All grades of glass except the finest were easily detected by the naked eye. The first two doses were given at intervals of four days; then daily until the dogs were

chloroformed. Post-mortem examn. failed to find any lesion gross or microscopic, and with the exception of the presence of glass the appearances were precisely the same as those in control dogs. L. W. RIGGS.

**The formation of enzymes. VII. MARTIN JACOBY.** *Biochem. Z.* 88, 35-42 (1918); *J. Chem. Soc.* 114, I, 469; cf. *C. A.* 11, 2207, 2683, 3286; 12, 816, 1300, 2327.—The conditions for the formation of the catalase of *Proteus* were investigated. While leucine is essential for the formation of urease by this species of bacteria, this is not the case for the formation of the catalase. Other amino acids, such as aspartic acid and alanine, can be employed and a considerable development of this enzyme takes place in a medium containing, besides the essential inorg. salts and one of these amino acids, Na lactate. The catalase acts after the bacteria have been killed (that is, in the presence of toluene). If inactivated by not too large quantities of  $\text{HgCl}_2$  and too long a period of contact with this substance, its activity can be restored by treatment with KCN. C. J. WEST.

**The catalase of bacteria. MARTIN JACOBY.** *Biochem. Z.* 89, 350-4 (1918); *J. Chem. Soc.* 114, I, 517.—J. describes attempts to prepare a pure catalase. *Bacillus proteus* was grown on the medium already employed by the author, which contains, besides the inorg. salts, Na aspartate and lactate. From such cultures, an active catalase could be obtained by pptn. with  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{MgSO}_4$ , and NaCl. The ppt. obtained was dissolved in  $\text{H}_2\text{O}$ . A catalase could also be pptd. by  $\text{HgCl}_2$ ; in this case, an active prepn. was obtained by redissolving the ppt. in KCN soln. C. J. WEST.

**The photolytic and photodynamic action of an  $\alpha$ -furo- $\beta$ -diazole.** P. R. KOGLER. *Biochem. Z.* 89, 204-10 (1918); *J. Chem. Soc.* 114, I, 515.—The substance employed was  $\beta$ -naphthoxadiazole-4-sulfonic acid, which undergoes change on exposure to light. The photodynamic effects were demonstrated on the protozoön *Colpidium colpoda*. C. J. WEST.

**Arrest of alcoholic fermentation in the aldehyde stage. An experimental confirmation of the acetaldehyde pyruvic acid theory.** CARL NEUBERG AND ELSA REINFURTH. *Biochem. Z.* 89, 365-414 (1918); *J. Chem. Soc.* 114, I, 517-8.—N. has shown that yeast contains an enzyme which decomposes pyruvic acid into AcH and  $\text{CO}_2$ ; furthermore AcH is readily reduced during yeast fermentation to EtOH. It seemed, therefore, probable that AcH is an intermediate product in alc. fermentation. N. and R. now show that considerable amts. of AcH can be obtained in the ordinary yeast fermentation of sugars and can be isolated if the fermentation is carried out in the presence of  $\text{Na}_2\text{SO}_3$ . The equations representing the reactions are given. As 0.5 of the mol. should yield AcH, which acts as acceptor for the H evolved, it should not be expected that 1 mol. of sugar should yield more than 1 mol. of  $\text{CO}_2$  and one mol. of aldehyde. An amt. of aldehyde equiv. to 73.45% obtainable on this theory has been obtained. Details are given of the methods employed for the quant. determination of the aldehyde and alcohol formed during fermentation. C. J. WEST.

**Methylation of proteins. J. HERZIG AND KARL LANDSTEINER.** *Monatsh.* 39, 369-84 (1918); *J. Chem. Soc.* 114, I, 508-9.—In the earlier investigations, it was shown that for various proteins the action of  $\text{CH}_3\text{N}_3$  gives products containing a fairly uniform % of Me radical, as indicated by the figures 3.68-4.86% of MeO and 3.72-5.34% of Me attached to N; silk fibroin alone was exceptional, the product from this containing 2.79% MeO and 4.93% of imino-Me, even after repeated methylation. Wool, after being submitted repeatedly to the action of  $\text{CH}_3\text{N}_3$ , contains 5.89% of MeO and 6.28% of amino-Me. In a similar examn. of the alc.-sol. protein from grain, it was found that the zein of maize is rather resistant to  $\text{CH}_3\text{N}_3$ , giving after several treatments a product containing 4.17% of MeO and only 2.9% of amino-Me; gliadin from wheat is



more reactive, and gives a product containing 7.06% of MeO and 2.56% of imino-Me. Non-coagulated serum albumin from the horse gives results similar to those obtained with the coagulated product. (With F. ZIPPERER and M. QUITTNER.) A similar examn. was made of the effect on proteins of a 10-hr. treatment with a boiling 1% soln. of HCl in MeOH; the products gave the following analytical results: Silk fibroin, 1.4% MeO, iminomethyl almost identical with that of the original substance. Wool, 3.80% MeO, 1.49% iminomethyl. With zein, and particularly with gliadin, the HCl causes considerable hydrolysis, a similar result being also obtained with Witte's peptone. The product from zein contains 5.47-6.18% of MeO but the Me-N content is almost unaltered. With gliadin, a large proportion passes into soln., the undissolved residue as well as the portion of the dissolved material precipitable with  $\text{Et}_2\text{O}$ , containing approx. 7% of MeO; it is probable that the extent of the hydrolytic effect of the MeOH-HCl is greater than these figures indicate, because the resulting glutamic acid is remarkably resistant to esterification by this reagent. It is also probable that to some extent esterification products formed in the earlier stages of the treatment undergo subsequent hydrolysis by the action of  $\text{H}_2\text{O}$  resulting from the interaction of the HCl and MeOH. The product of the reaction between zein and gliadin and MeOH-HCl on treatment with  $\text{CH}_3\text{N}_3$ , undergoes a marked increase in the MeO content, which, however, is probably due to the presence of phenolic groups.

C. J. WEST.

**Biology of silicic acid and aluminium oxide in birds feathers.** MAX GONNERMANN. *Z. physiol. Chem.* 102, 78-84(1918); *J. Chem. Soc.* 114, I, 465.—Feathers almost always contain silicic acid and  $\text{Al}_2\text{O}_3$ . The amts. vary considerably in different birds and appear to depend largely on the content of these substances in the food. The largest quantity of silicic acid found was in the feather of the dove, *Columba palumbus* (77% of the total ash), while the feathers of the jay, *Corvus glandarius*, contained the most  $\text{Al}_2\text{O}_3$  (2.46%). Apparently, the feathers constitute a storing place for both substances.

C. J. WEST.

**Chemical studies on physiology. V. "Soluble" and "insoluble" colloids, genuine and spurious jellies, protoplasm and cell permeability.** E. HERZFELD AND R. KLINGER. *Biochem. Z.* 88, 232-82(1918); *J. Chem. Soc.* 114, II, 355; cf. *C. A.* 12, 809, 2094, 2373.—This is a theoretical paper in which H. and K. distinguish between "soluble and insoluble" colloids. They assume that in all cases of soln. the solute forms combinations with many mols. of the solvent, and solns. of all stages between molecularly dispersed and colloiddally dispersed particles exist. The latter form "soluble" colloids. In contradistinction to these, "insoluble" colloids exist, which owe their dispersion to the adsorption of the substances on their surface with great affinity for water. To the latter class proteins belong. These views have been expressed in previous papers. Gelatin is regarded as a mixt. of polypeptides polymerized by means of Ca salts. Jellies are formed from colloids with colloids with great power of combining with water, and come into existence when the whole of the water in the system is accumulated on the surface of the colloidal particles. Corresponding with the "soluble" and "insoluble" colloids are the "genuine" and "spurious" jellies, the former of which only are reversible. H. and K. discuss the applications of their ideas to the problems of cell permeability and metabolism.

C. J. WEST.

**Coenzyme of fermentation in the animal body. II.** OTTO MEYERHOF. *Z. physiol. Chem.* 102, 1-32(1918); *J. Chem. Soc.* 114, I, 464; cf. *C. A.* 12, 2092.—The coenzyme of zymase appears to exist in almost all the tissues of the frog and rabbit. It is present in relatively the largest amt. in the frog muscle; it is absent from blood serum. It is most readily extd. by boiling water. Cold water exts. contain the coenzyme, but an inhibitory substance is also present which is destroyed on boiling. The inhibitory substance exerts its action on zymase and not on the coenzyme and

appears to be of a protein nature. The chem. properties of the coenzyme in muscle resemble those associated with the coenzyme in yeast. It is dialyzable, not destroyed by boiling, pptd. by alc., adsorbed by charcoal, etc. The course of fermentation with the muscle coenzyme is analogous to that observed when the coenzyme from yeast is employed. The respiratory substance which accelerates the oxidation process in muscle appears to be identical with the coenzyme of yeast and muscle. A similar coenzyme is also present in germinating yeast.

C. J. WEST.

**Action of chymosin and pepsin.** IV. Action of the enzymes on sodium caseinogenate. OLOF HAMMARSTEN. *Z. physiol. Chem.* 102, 33-77(1918); *J. Chem. Soc.* 114, I, 459-60; cf. *C. A.* 9, 2904.—Two exts. of gastric mucous membrane may show equal enzymic activity when tested by their power of coagulating milk, and yet show considerable differences in their digesting power on fibrin or white of egg. This want of parallelism is found also when the substrate chosen in each case is caseinogen and the activity is tested first in the presence of alkali and then in that of acid. In the former case the solns. become opalescent and a ppt. forms, while albumoses are produced in considerable amt. and although there does not appear to be a direct proportionality between the strength of the chymosin and the time in which the opalescence becomes of a definite degree or the ppt. just perceptible, or between the quantity of chymosin present and the amt. of albumose produced in a given time, yet the relative strengths of two chymosin solns. may be compared in either of these ways. The results can be interpreted most easily by regarding chymosin and pepsin as sep. enzymes, and this view is confirmed by the fact that the differences observed between the coagulating and digesting powers of the 2 exts. are exactly paralleled by the differences in their behavior towards caseinogen in alk. and acid soln., resp. Thus, if one of two solns. of equal peptic power clots milk with greater rapidity than the other, then its action on caseinogen in alk. soln. is found to be much more marked and rapid than is the case with the other enzymic soln. V. Action of the enzymes on legumin from peas. *Z. physiol. Chem.* 102, 105-47; *J. Chem. Soc.* 114, I, 510.—Chymosin acts on other proteins besides caseinogen, forming albuminoses. Acid- and alkali-legumin are hydrolyzed by chymosin in neutral solns. or in the presence of so little acid that any pepsin present would exert little or no hydrolytic action. The results are considered by the author to support the theory that assigns a sep. identity to chymosin and pepsin.

C. J. WEST.

Cleavage of digitonin cholesteride (WINDAUS) 10.

CONKLIN, EDWIN G.: *Heredity and Environment*. Revized 2nd Ed. Princeton: Princeton University Press. 550 pp. \$2.00. For review see *J. Phys. Chem.* 22, 647.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

**Detection of bile pigments.** DEJAGER. *Pharm. Zentr.* 58, 442(1917); *Schweiz. Apoth.-Ztg.* 56, 264(1918).—To test urine for bile pigment: Add 2 drops of 0.5%  $\text{NaNO}_2$  soln. to a 5 cc. sample and overlay with dil. HCl; a green ring in the latter indicates the presence of bile pigments. Another test is carried out as follows: To the sample add several drops of  $\text{ZnCl}_2$  soln. and filter off the ppt.; overlay the filtrate with a mixt. of 1 cc. concd. HCl, 9 cc. alc., and 2 drops of 0.5%  $\text{NaNO}_2$  soln. If bile pigment is present the filtrate shows an emerald-green color.

C. O. EWING.

**Detection of blood in urine.** FULD. *Pharm. Zentr.* 58, 467(1917); *Schweiz. Apoth.-Ztg.* 56, 265(1918).—The reagent is prepd. by dissolving 0.2 g. rhodamine in 50 cc. alc. and decolorizing the resulting strongly fluorescent light red soln. by boiling it with 5 g. Zn dust and 4 cc. 10% NaOH soln. A 1:10,000,000 soln. of dried blood produces a red color in the reagent.

C. O. EWING.

The determination of sugars in so-called "levulosuria." J. PRESCHER. *Pharm. Zentr.* 59, 43-4(1918); *Chem. Zentr.* 1918, I, 881.—The following method is more advantageous than the Soxhlet method for the detn. of levulose and dextrose in urine when the disparity between their amts. is not too great. A measured portion of urine is cleared with Pb acetate, made up to volume, and a portion polarized at 15°; in another portion the total sugars are detd. as invert sugar by the method of Meiszl. Since in about 10% soln.  $[\alpha]_D^{15}$  for dextrose is 52.5 and for levulose 95.5,  $[\alpha] = -0.955 l + 0.525 d$ , whence, since

$$d = s - l \text{ and } l = s - d, l = \frac{(0.525 s - [\alpha])}{1.48} \text{ and } d = \frac{(0.955 s + [\alpha])}{1.48},$$

where  $d$  = dextrose,  $l$  = levulose,  $s$  = total sugars, and  $[\alpha]$  = sp. rotation at 15° in a 100 mm. tube. If the reading is made at 20° the no. 1.48 should be replaced by 1.45.

C. O. EWING.

Modification of the technic of the Voges and Proskauer reaction. GEO. C. BUNKER, EDWARD J. TUCKER AND HOWARD W. GREEN. *J. Bact.* 3, 493-8(1918).—The use of 0.5 cc. of a 45% soln. of NaOH, Syracuse watch glasses, and 1 cc. of the culture results in the development of a greater number of positive Voges and Proskauer reactions in a shorter interval of time than the method given in the latest (1917) edition of "Standard Methods of Water Analysis." An incubation period of two days at 30° is recommended in place of that of 5 days in order to obtain the max. number of positive Voges and Proskauer reactions from glucose- $K_2HPO_4$  broth.

JOHN T. MYERS.

Determination of protein sugar. H. BERRY AND L. RANDOIN-FANDARD. *Compt. rend. soc. biol.* 81, 476-80(1918).—The blood or plasma must be dild. with at least 3 vols.  $H_2O$  for the former and 1½ vols.  $H_2O$  for the latter before hydrolysis of the protein-sugar compd. The same results were obtained by hydrolyzing this compd. with various acids ( $HCl$ ,  $H_2SO_4$ ,  $HF$ ), providing the proportion of acid and period of heating were properly varied. The following method is proposed for detn. of combined or protein sugar in the blood: Collect the blood in an equal vol. of 2:1000 NaF soln. (e. g., 50 cc. of each), add 90 cc. distd.  $H_2O$  and (drop by drop) 4 cc. of concd.  $H_2SO_4$  (free from  $HNO_3$  and  $HNO_2$ ) dild. with 10 cc.  $H_2O$  and heat 40 mins. in an autoclave at 120°. After cooling neutralize with dil. NaOH, add slowly with const. agitation 80 cc. of 40%  $Hg(NO_3)_2$  soln. (prepd. by dissolving  $Hg(NO_3)_2$  in  $H_2O$  containing  $HNO_3$ ), add NaOH to very slight alk. to litmus and then add 1-2 drops 50% AcOH to produce slight acidity. Complete the vol. to 400 cc., filter and remove excess Hg with  $H_2S$  or Zn powder. If it is necessary to concentrate the soln. owing to very low concn. of reducing sugar this should be done at a temp. below 50° *in vacuo*. For detn. of combined sugar in the plasma collect the blood in a vessel to which 0.10 g. finely powdered NaF has been added for each 50 cc. of blood, stir gently, centrifuge at once and separate the plasma by decantation. The operation requires 6-7 mins. and no coagulation or glycolysis occurs under these conditions. Fifty cc. of the plasma are then dild. with 75 cc.  $H_2O$ , mixed with 2.5 cc. concd.  $H_2SO_4$  and heated at 120° for 30 mins. The rest of the procedure is the same as for blood except that 35 cc. of  $Hg(NO_3)_2$  soln. are sufficient. Detn. of reducing sugar is effected in both cases by the Bertrand method and protein or combined sugar is calcd. by difference between total sugar as detd. above and free sugar. Results obtained with the blood of various animals at varying dilns. with  $H_2O$  and after hydrolysis with varying proportions of  $HCl$  and  $H_2SO_4$  are given in tabulated form.

H. S. PAINE.

Simple method of detecting methylene blue in urine; spectroscopic examination of biological liquids in layers of considerable depth. CL. GAUTIER. *Compt. rend. soc. biol.* 81, 496-7(1918).—Methylene blue may be readily detected by spectroscopic examn. after adding 1 drop of an aq. soln. containing 0.5 g. per l. to 200 cc. of filtered

urine; an observation of approx. 30 cm. length should be used. The above concn. of methylene blue does not represent the limit of sensitiveness of the method. Methylene blue exhibits a very intense absorption band in the red and a 2nd absorption band in the orange-yellow. Thionine may be detected by an intense absorption band in the yellow-orange-red with penumbra near the green. Fuchsin has a large (not very dark) absorption band in the green and eosin has a characteristic absorption band near the green and in the green-blue. H. S. PAINÉ.

**Estimations of the tension of carbon dioxide in the alveolar air by the Henderson-Russell modification of Haldane's method and their application for testing the stimulability of the breathing center.** EUGEN JENNI. *Biochem. Z.* 87, 331-58(1918); *J. Chem. Soc.* 114, I, 462.—By means of the modification by Henderson and Russell of Haldane's method, it was found that the  $\text{CO}_2$  tension of the alveolar air remained const. over prolonged periods. When the subject of expt. is used to the procedure, the variations amt. to but 2-3 mm. of Hg; the method is not, however, well adapted to clinical purposes. In case of emphysema investigated, the tension of  $\text{CO}_2$  was high. The method can be employed for testing the irritability of the breathing center. For inhibition, the drugs morphine and pantopone were employed; both cause marked increase in the tension of  $\text{CO}_2$  in the alveolar air. The preparation of Pavon-Ciba, in corresponding therapeutic doses, causes little alteration in this tension and its inhibitory action on the breathing center is less than that of morphine or pantopone. Ak. is an excitant of the inhibitory center in these doses used by J. C. J. WEST.

**Detection of *d*-glycuronic acid and other acids with similar behavior by the naphtha-resorcinol reaction.** A. W. VAN DER HAAR. *Biochem. Z.* 88, 205-12(1918); *J. Chem. Soc.* 114, II, 376.—An application of Neuberg and Saneyoshi's modification of Tollen's reaction, as applied to plant products. The substance is 1st hydrolyzed with 5%  $\text{H}_2\text{SO}_4$ , the mixt. is then neutralized with  $\text{Ba}(\text{OH})_2$ , and concd. after filtration,  $\text{Pb}(\text{OAc})_2$  is added, and after filtration, basic lead acetate; the glucuronate is contained in the ppt. thus produced, and this is then heated with 10 cc. of 10%  $\text{HCl}$  and 100 mg. of naphtha-resorcinol for 1 min. After cooling to  $50^\circ$ ,  $\text{C}_6\text{H}_6$  is added, and if glucuronic acid is present, this on shaking takes up a violet pigment, which gives a characteristic D band of the spectrum. C. J. WEST.

**Combined estimation of tyrosine and uric acid in the same solution.** E. HERZFELD AND R. KLINGER. *Biochem. Z.* 88, 283-5(1918); *J. Chem. Soc.* 114, II, 415.—Folin's phenol reagent is employed. It gives a color twice as strong with tyrosine as with uric acid. The color with the soln. of the 2 substances is 1st estd., then uric acid is destroyed by  $\text{H}_2\text{O}_2$  and  $\text{NaOH}$ , then the phenol reagent is added again, under conditions specified and the tyrosine alone is detd. colorimetrically. C. J. WEST.

**The Haldane-Henderson method for estimating the tension of alveolar carbon dioxide and the influence of oxygen on the stimulability of the respiratory centers.** MOTIO YAMADA. *Biochem. Z.* 89, 27-47(1918); *J. Chem. Soc.* 114, I, 511.—A new valve is described for use with Henderson's modification of Haldane's method for estg. alveolar  $\text{CO}_2$ . It was found that when the amt. of  $\text{CO}_2$  inhaled was greater than normal, the alveolar ventilation was better when the gas was mixed with pure O than when mixed with air. Hence O has a favorable influence on the breathing center. No influence could be found to be exerted on the respiratory center by the inhalation of pure O. C. J. WEST.

**Detection of mercury in urine, with employment of a new solvent for mercuric sulfide.** S. GUTMAN. *Biochem. Z.* 89, 199-203(1918); *J. Chem. Soc.* 114, II, 409.—The solvent is a soln. of  $\text{HI}$ , prepd. by dissolving 5 g.  $\text{KI}$  in 12 cc. 10%  $\text{H}_2\text{SO}_4$  and dilg. to 25 cc. The urine is treated 1st with  $\text{HCl}$  and  $\text{KClO}_3$  to destroy the

org. matter. From the slightly acid soln. Hg is pptd. by  $H_2S$ . The sulfide is purified by dissolving in aqua regia and repptn. with  $H_2S$ . This ppt., if it is  $HgS$ , should be insol. in hot  $HNO_3$  but sol. in aqua regia and the given soln. of HI. C. J. WEST.

**Standardization of antimeningococcic serum.** HAROLD L. AMOSS AND PENELOPE MARSH. Rockefeller Inst. *J. Exp. Med.* 28, 779-90(1918).—The results obtained were variable. A. and M. feel that the protective power for laboratory animals is an unsuitable index of its value in human medicine and is inferior to the agglutination titer as a standard of potency. C. J. WEST.

**Clinical value of freezing-point determinations.** FRITZ EIGENBERGER. *Z. physiol. Chem.* 102, 166-75(1918); *J. Chem. Soc.* 114, I, 512.—The addition of urea, dextrose or NaCl to a colloidal soln. of gelatin, starch or blood-serum produces scarcely any lowering of the freezing point, measured by Beckmann's method. When an acid or alkali is added, a considerable depression may be observed but it does not equal the calcd. value. E. draws the conclusion that the detn. of the freezing point of a pathological serum is not likely to furnish any valuable clinical information. C. J. WEST.

**The microchemical estimation of nitrogen.** IVAR BANG. *Biochem. Z.* 88, 416-9(1918); *J. Chem. Soc.* 114, II, 369.—A reply to criticisms of Sjollem and Hesseschly (*C. A.* 12, 1473). C. J. WEST.

**Normal salt solution (GERSHENFELD) 17.** New reaction for acetylcarbinol (BAUDISCH) 7. Quantitative determination of gold, especially in animal tissue (CADDWELL, LEAVELL) 7. Determination of nitrite and nitrate in presence of one another (OELSNER) 7. Determination of reducing sugars (CLARK) 7. Determination of aldehyde sugars (COLIN, LIEVIN) 7.

### C. BACTERIOLOGY.

**Synthetic medium for the direct enumeration of organisms of the colonaerogenes group.** S. HENRY AYERS AND PHILIP RUPP. *J. Bact.* 3, 433-6(1918).—A simple synthetic medium has been devised in which there is a single source of N, namely,  $Na(NH_4)PO_4$  and a single source of C, namely lactose. Compn. of the medium, Soln. I:  $Na_2HPO_4$  0.4%,  $KH_2PO_4$  0.2%, lactose 1.0%; dissolve in distd. water. Soln. II: filtered soln. of agar in distd. water, 3.0%. Mix soln. I and II in equal proportions while hot and put up in definite amts. of 100 cc., or more, in flasks or bottles and sterilize. At the time of plating, after the agar medium is melted and while at its highest temp. add for each 100 cc. of medium 0.5 cc. of a 1% alc. basic fuchsin soln. and follow at once with 0.5 cc. of a freshly prepd. 5%  $Na_2SO_4$  soln. JOHN T. MYERS.

**Endo medium for the isolation of *Bacillus dysenteriae* and a double sugar medium for the differentiation of *B. dysenteriae*, *shiga* and *flexner*.** I. J. KLIGLER AND J. DEFANDORFER. *J. Bact.* 3, 437-40(1918). JOHN T. MYERS.

**Influence of dicyanodiamide on the growth of various microorganisms.** LUISE MOLLER. *Biochem. Z.* 88, 85-96(1918); *J. Chem. Soc.* 114, I, 469.—Expts. were carried out with various wild yeasts, molds and bacteria, and these indicate that dicyanodiamide has no advantage as a sole source of N for organisms. On the contrary, it exerts a deleterious action on their growth. C. J. WEST.

**General relationship of aldehydes to alcoholic fermentation.** The coenzyme of yeast. CARL NEUBERG. *Biochem. Z.* 88, 145-204(1918); *J. Chem. Soc.* 114, I, 469-70.—N. gives detailed expts. which confirm his previous statement that aldehydes generally accelerate the alc. fermentation by yeasts of dextrose and mannose. His expts. include a series of fatty aldehydes from formaldehyde up to decaldehyde, chloral hydrate, hydroxaldehydes (aldol, acetopropionaldol), unsatd. aldehydes, citronellal and citral), aromatic aldehydes (benzaldehyde, *p*-isopropylbenzaldehyde, phenylacet-

aldehyde), aromatic hydroxyaldehydes and their ethers (salicylaldehyde, *p*-hydroxybenzaldehyde, anisaldehyde, piperonal, and vanillin, which is the only aldehyde which failed to give acceleration), the unsatd. aromatic aldehyde, cinnamaldehyde, cyclic aldehydes (furfuraldehyde and cyclocitral), dialdehydes (glyoxal, isophthalaldehydes, terephthalaldehyde), ketoaldehydes (methylglyoxal and phenylglyoxal) and aldehyde acids. N. also confirms his former statement that a mixture of keto-acids with  $K_2HPO_4$  acts as a co-enzyme. He suggests that certain differences in results on this point obtained by Harden may be due to the fact that the yeast preps. employed by the latter were not quite free from co-enzymes.

C. J. WEST.

## D. BOTANY.

CARL L. ALSBERG.

A simple method of demonstrating the production of aldehyde by chlorophyll and by aniline dyes in the presence of sunlight. W. J. V. OSTERHOUT. *Am. J. Botany* 5, 511-3 (1918).—The method consists in extg. chlorophyll from fresh leaves by means of alc., shaking the alc. with  $CCl_4$ , and sprinkling the latter on filter paper in sufficient amts. to give it a deep green color. This is placed in air-tight bell jars with a large Petri dish containing 5 cc.  $H_2O$ , some being kept in the dark and others in the light until the chlorophyll is bleached to a pale green, which may require several days. The  $H_2O$  in the dishes kept in the dark gives negative tests for aldehyde; that in the dishes kept in the light gives positive tests. Aniline dyes substituted for chlorophyll also gave positive results for aldehydes.

J. J. SKINNER.

Root absorption from solutions at minimum concentrations. R. B. HARVEY AND R. H. TRUE. *Am. J. Botany* 5, 516-21 (1918).—The equil. concn. of electrolytes established by the squash, peanut, soy bean, and sweet corn grown in  $H_2O$  cultures was found to be specific for each plant. At the point of equil. between the plant and the soln., the electrolyte content of the soln. is detd. 1st by certain factors which are const. for different plants under the same conditions, such as the  $CO_2$  equil. with the air, and 2nd by the rate of cleavage of ion-producing compds. of the cell and the absorption of the ions produced. The equil. concn. value is independent of the kind of nutrient salt used, the concn. of the electrolyte, or the vol. of the soln., provided the concn. is below the toxic limit for the plant, and that the quantity of salt is within the requirements of the plant.

J. J. SKINNER.

Legumin in peas. OLOF HAMMARSTEN. *Z. physiol. Chem.* 102, 85-104 (1918); *J. Chem. Soc.* 114, I, 509-10.—The legumin prepd. from peas by extn. with salt soln. and subsequent removal of the salt by dialysis is sol. in dil. salt solns. and thus differs from the insol. legumin obtained from the peas by extn. with  $H_2O$  or dil. alkali, followed by pptn. with dil.  $AcOH$ . H. proposes to designate the former as *a*-legumin and the latter as *b*-legumin. *b*-legumin appears to be an acid metaprotein. *a*-legumin also forms a compd. with acid, which, however, is not *b*-legumin, because the latter swells in water, giving a viscid, non-filterable soln., whereas the acid compd. of *a*-legumin does not swell in water but gives a limpid, milky emulsion, which filters readily, yielding an opalescent filtrate. Other slight differences in the properties of *a*- and *b*-legumins are described, which indicate that *b*-legumin is not formed from *a*-legumin by the action of acid, alkali or water but is a distinct protein.

C. J. WEST.

The distribution of the aluminium ion in plants. JULIUS STOKLASA, J. SEBOR, W. ZDOBNICKY, F. TYMICK, O. HORAK, A. NEMEC AND J. CWACH. *Biochem. Z.* 88, 292-322 (1918); *J. Chem. Soc.* 114, I, 475.—Al is widely distributed in plants. A large no. of analyses is tabulated. The xerophytes contain only small amts. of Al, whereas the hydrophytes and hygrophilic plants contain relatively large quantities. The mesophytes when growing on dry soils are very poor in Al, but contain an appreciable quantity when growing on marshy ground.

C. J. WEST.

**Physiological significance of potassium in plants.** TH. WEEVERS. *Biochem. Z.* 89, 281-2(1918); *J. Chem. Soc.* 114, I, 518.—A final reply to Stoklasa. Cf. *C. A.* 2, 1317; 12, 165. C. J. WEST.

**Biochemistry of seaweeds.** HARALD KYLIN. *Z. physiol. Chem.* 101, 236-47 (1918); *J. Chem. Soc.* 114, I, 476.—Various kinds of algae have been examd. for the presence of sol. carbohydrates and laminarin. Of 8 species of brown algae, two, *Desmarestia aculeata* and *D. viridis*, contained laminarin, while in all the % of sol. carbohydrates was small. Four species of *Floridæ* were found to contain trehalose but not mannitol. Of the *Chlorophyceæ* investigated, *Cladophora rupestris* contained 15% of sol. carbohydrates, including sucrose and a levorotatory polysaccharide resembling inulin. C. J. WEST.

KRAEMER, HENRY: *Applied and Economic Botany*. 2nd Ed. New York: John Wiley & Sons, Inc. 822 pp. \$6.00.

Calcium oxalate in the dasheen (BLACK) 12.

### E. NUTRITION.

PHILIP B. HAWK.

#### NORMAL.

**The value of skim-milk and meat scraps for white plymouth rocks.** A. G. PHILIPS. *Purdue Agr. Expt. Sta., Bull.* 218, 20 pp.(1918).—The expts. consisted of feeding to 3 lots of pullets a mixed grain and mash feed of bran and shorts; 1 lot was fed in addition meat scraps, and a 2nd skim-milk, the 3rd serving as a check. Eggs from pullets fed meat scraps were more fertile but had weaker hatching power than eggs from those fed skim-milk. The egg production per year averaged 140.2 eggs per pullet when fed skim-milk, 135.9 for those fed meat scraps and 61.2 for those serving as checks. J. J. SKINNER.

**Nuclein metabolism. V. Destruction of the purine ring by bacteria in the human intestine.** S. J. THANNHAUSER AND G. DORFMÜLLER. *Z. physiol. Chem.* 102, 148-59(1918); *J. Chem. Soc.* 114, I, 513; cf. *C. A.* 8, 3580, 3581; 10, 182; 12, 929.—After 20 days' incubation of adenosine, guanosine or inosine with a culture of bacteria from the human intestine, from 60 to 100% of the N in the nucleosides is found to have been converted into  $\text{NH}_3$ . These results are in harmony with and explain the observation that the purines in ingested nucleic acid are not quantitatively excreted in the form of uric acid, but to a certain extent undergo degradation in the body and are eliminated as urea (doubtless through the intermediate formation of ammonia by the action of the intestinal bacteria). C. J. WEST.

### F. PHYSIOLOGY.

ANDREW HUNTER.

**Shock and its control.** W. B. CANNON. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 544(1918).—The observations were made at a casualty clearing station in France, a few miles back from the front lines trenches. The main conclusions are: (1) There is a discrepancy between the red counts, hemoglobin and hematocrit readings of venous and capillary blood in shock cases, indicating a concn. of blood in capillaries. (2) The shock cases, when received at the clearing station, have a diminished alk. reserve (an acidosis, in the Van Slyke sense). (3) A rough correspondence exists between the degree of acidosis and the degree of depression of the blood pressure. (4) Surgical operation, in many cases, lowers the alk. reserve, and in shock cases operation may in a short time reduce the reserve to a serious degree. (5) In shock cases the low alk. reserve and low arterial blood pressure are made worse by the necessary operation. (6) By the injection of  $\text{NaHCO}_3$  intravenously at the start of the operation both the

unfavorable effects of the operation are obviated—the pressure is higher at the end than at the start and the alk. deficiency is abolished. G. MCGUIRE.

Some reactions in the development of shock by diverse methods. J. ERLANGER, *et al. Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 546(1918).—"Shock supervenes in consequence of extensive tissue damage, not necessarily traumatic in origin." In all forms of shock there occurs a diminution in plasma vol. There is often a reduction in the vol. of blood as a whole. Usually the vasoconstriction is affected although it is possible to have shock with a normal vasoconstriction. In the mechanism of shock three factors predominate: (1) Generalized transudation, caused by slowing of the blood stream to the point of damaging the cells. (2) Low arterial reserve. (3) Diminished alk. reserve. Sometimes one, sometimes another, of these factors predominates.

G. MCGUIRE.

The blood volume changes in shock and the modification of these by acacia. H. S. GASSER, W. J. MEEK AND J. ERLANGER. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 45, 547(1918).—"The forms of shock studied were those produced by exposure of the intestine, injection of adrenaline, and temporary partial occlusion of the vena cava or the aorta. The findings in all cases were essentially the same." The injection of acacia reduced the decrease of plasma from about 22.2% of the total blood vol. to 7.4%. "Loss of plasma accounted for all the decrease in blood vol. in one-third of the cases." It is concluded that the decrease in plasma loss upon the injection of acacia is most likely to be found in decreased permeability of the vessels. In the amts. used the colloidal osmotic pressure of the plasma would increase about 14.5%. This would act in the direction of absorption, but the blood counts gave no evidence that any appreciable expansion of the plasma vol. from the tissues takes place in one hr. The possibility that acacia acts as a Ca salt in decreasing the permeability of the vessels is suggested.

G. MCGUIRE.

The influence of the increase of osmotic pressure of the liquids of the body on the different cell substrata. S. DE BOER. *Proc. Acad. Sci. Amsterdam* 21, 151-7(1918).—Osmotic pressure was increased as follows: by placing frogs in Ringer soln. containing 18 g. NaCl so that all but the head and back were immersed, by immersing in a 1.38% soln. of glucose, by placing frogs in a dry bottle and passing dry air through it, and by replacing the blood from the vena abdominalis with the NaCl soln. used above. Under all 4 conditions the same phenomena of coma, passivity, and lack of reaction were observed, the respiration showed the periodicity known as the Cheyne-Stokes reaction and the surface of the pupils had the appearance of cataract. All the phenomena disappeared when the animal was placed in water. The cataract is attributed to a congelation of albuminous substances in consequence of the increase in the concn. of the body fluids.

F. POWDERMAKER.

Tropistic action of blood vessels on the migration of chromatophores. H. D. TAYLOR. Rockefeller Inst. *J. Exp. Med.* 29, 135-8(1919).—"The migration of the chromatophores of the yellow sac of *Fundulus heteroclitus* seems to be chemotropic in character. The determining factor seems to be a high tension of O or a comparatively low concn. of H ions.

C. J. WEST.

Agglutination of red blood corpuscles and the Hofmeister series. W. RADSMAN. *Biochem. Z.* 89, 211-9(1918); *J. Chem. Soc.* 114, I, 511-2.—Blood corpuscles, suspended in a large amt. of isotonic soln. of dextrose, readily agglutinate on addition of a small amt. of a salt; 0.04% of NaCl is sufficient to bring about this phenomenon. The anions, in their activity as regards this agglutinative effect, follow the order of the Hofmeister series and this indicates that some hydrophil colloid plays a part in maintaining the stability of a suspension of the corpuscles.

C. J. WEST.



**Possibilities of fractional gastric analysis.** MARTIN E. REHFUSS. Jefferson Med. Coll. *J. Am. Med. Assoc.* 71, 1534-7(1918).—The following conclusions are stated: "Fractional gastric analysis alone can reveal the evolution of gastric digestion. Gastric digestion, whether normal or pathol., consists of a series of constantly changing phases. Certain phases are normal, certain are obviously pathol. Normal gastric physiology consists in a rhythmic series of cycles in which we may differentiate the digestive and the interdigestive periods. In health, they succeed each other regularly; in disease, their sequence is seriously interfered with. The digestive cycle is the response of the stomach to a definite stimulus. The response is partly psychic and partly chem., but in its essential characteristics it differs from the interdigestive phase. There is always a physiol. active secretion in the stomach but the characteristics of the two periods are very different. The digestive secretion persisting into the interdigestive period is pathol. Studies of healthy men indicate that there is no acidity in disease which cannot be encountered in health, and the diagnostic value of high acidity must be very carefully worked out. Forty-five % of more than 800 normal cases gave a total acidity of 100 in excess. Normally, we point out three different secretory types. Pathologically every possible variation in secretory output occurs. At present it seems that there are many possibilities in the analysis of each variety of curve. It is at this point that circumstantial evidence by the study of the protein curve, pus, blood, mucus, bacteria and tryptic regurgitation may throw light on the subject. In every case the extragastric as well as the gastric causes must be reviewed. The gastric response may be shortened, delayed or exaggerated. It may be accompanied by the most marked variations in secretory and acid concn. output. It may be altered by the addition of pus, blood, mucus, and bacteria in every possible way, and these variations may occur only at certain portions of the curve, emphasizing the necessity for complete examn. The investigation of psychic secretion, tryptic and biliary regurgitation, hypersecretion, protein concn. and secretory velocity, and of the evidence of pathol. material is full of promise."

L. W. RIGGS.

## G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**The influence of active normal serum (complement) upon meningococci. I. The opsonic activity of fresh normal serum alone and in combination with antimenigitis serum for meningococci.** J. A. KOLMER, I. TOYAMA AND T. MATSUNAMI. Univ. of Pa. *J. Immunology* 3, 157-200(1918).—The bactericidal activity *in vitro* of different antimenigitis sera was found to be quite low. Fresh or active antimenigitis serum was somewhat more bactericidal than the same serum after inactivation by heating at 60° for 30 min. The bactericidal activity of horse antimenigitis and normal human and guinea pig serum is largely independent of complemental bacteriolysis. The addition of active normal human and guinea pig to antimenigitis serum sometimes increased the bactericidal activity of the latter. Whole human and guinea pig blood was found slightly more bactericidal than the serum alone. Normal human and guinea pig serum frequently agglutinate meningococci in final dilns. up to 1:4, but not in higher dilns. These sera were practically without demonstrable protective value in mice infected with virulent meningococci, although the addition of these normal sera to antimenigitis serum appeared in some expts. slightly to increase the protective power of the latter. It is suggested as worthy of a clinical trial to complement the antimenigitis serum by the addition of active human or guinea pig serum prior to intraspinal injection and particularly in the treatment of severe and serum-resistant infections.

GEO. T. CALDWELL.

**The relation of the meningococcal activity of the blood to resistance to virulent meningococci.** T. MATSUNAMI AND J. A. KOLMER. Univ. Pa. *J. Immunology* 3,

201-12(1918).—Bactericidal tests with a strain of virulent normal meningococci and the blood of adult white mice, adult rabbits and young and older guinea pigs have shown that the blood of rabbits possesses more bactericidal activity; the blood of old guinea pigs was found somewhat more bactericidal than the blood of young guinea pigs and white mice. The blood of young guinea pigs was generally slightly more bactericidal than the blood of adult white mice. In the virulence tests consisting in the intraperitoneal injection of the same culture in graded doses and according to body wt., rabbits were found more resistant; young guinea pigs were about as susceptible as adult mice while older guinea pigs were somewhat more resistant than either. It seems that there is a general parallelism between the meningococcal activity of the blood and resistance to meningococci and at least one factor in natural immunity to the meningococcus is the presence of bactericidal substance in the blood. The meningococcal activity of blood of children is somewhat less than that of adults. It is probable that certain persons possess sufficient natural immunity to the meningococcus to afford protection against meningitis and it is highly desirable to discover a simple and accurate clin. test or measure of this resistance comparable to the Schick test for antitoxic immunity in diphtheria as a means of encouraging active immunization with meningococcus vaccines.

GEO T. CALDWELL.

The study of problems of immunity by the tissue culture method. I. A study of the cells and blood plasma of animals which are naturally resistant and others which are susceptible to diphtheria and tetanus toxins. Y. SUZUKI. *St. Louis. J. Immunology* 3, 233-46(1918).—The natural immunity of rats for diphtheria toxin and chickens for tetanus is due to two factors—a special resistance of at least certain of the cells of these animals, and the existence of neutralizing substances in their plasma. The plasma of these animals protects against lethal doses of toxin not only their own cells but also the cells of susceptible animals. Thus far heart muscle, ovary and connective tissue cells have been studied. As sufficient expts. have not been made to give quantitative results, a further investigation into the nature of the cellular resistance and the mechanism of neutralization as indicated in the plasma tests can be accomplished by this method. II. The tissue cultures as a means for quantitatively estimating toxin and antitoxin and determining the distribution of antitoxin in passively immunized animals. M. T. BURROWS AND Y. SUZUKI. *Ibid* 219-32.—It has been shown that chicken's tissues are sensitive in the tissue culture to the action of diphtheria toxin where this is added to the medium. Antitoxin when injected into chickens protects them against lethal doses of toxin. It seemed evident that the tissue culture method would be of use for the quant. standardization of toxins. In the expts. reported the tissue cells of young chickens and chick embryos were studied. The medium consisted of plasma prepd. from the blood of young or adult chickens, dild. with the substances to be tested. Fragments of tissue or single cells are placed on the surface of a cover glass and covered with a layer of medium about 0.5 mm. in thickness. A hollow slide rimmed with vaseline is inverted over the cover so that the tissue and plasma mixt. is sealed in the hollow air chamber. After clotting had taken place the slides were inverted and the cover glasses sealed more completely by running them with paraffin. Only diphtheria toxin was investigated, but its study indicated the value of the method for detg. the neutralizing power of a plasma for any given toxin.

GEO. T. CALDWELL.

Typhus fever. Observations on a serological test (Weil-Felix reaction). C. M. CRAIG AND N. H. FAIRLEY. *Lancet* 1918, II, 385-6.—Typhus serum possesses the power of agglutinating certain intestinal organisms. The stock culture here used is an organism of the strain known as X 19; it is a short Gram-negative, slightly motile bacillus, which grows under aerobic conditions only. It produces indole freely and acid without

clot formation in milk. A rapid agglutination in a diln. of  $1/10$  while not absolutely reliable is sufficiently suspicious to justify isolation of the case. Frequently the reaction appears early in the disease and as a rule rapidly increases in titer. GEO. T. CALDWELL.

The chemistry of diphtheria antitoxin—a review. ALBERT C. CRAWFORD AND MARJORIE G. FOSTER. *Am. J. Pharm.* 90, 765-82(1918). W. G. GAESSLER.

Electrolytic theory of dental caries. II. PAUL R. MANNING. *Dental Cosmos* 61, 21-7(1919); cf. *C. A.* 12, 937.—The dentin may function as a semipermeable membrane. When a plate of dentin 0.25 mm. thick was used as a membrane between a soln. of an electrolyte and distd. water, water passed through the plate in the direction of the soln. of the electrolyte. Diffusion of salts through the plate was not obtained. Enamel was apparently capable of assuming an electrical polar quality when immersed in a soln. of electrolytes. Presence of water was found essential for the inception and progress of dental caries. JOSEPH S. HEPBURN.

Constituents of alcoholic extracts of organs which are active in Wassermann's reaction. FRITZ SILBERSTEIN. *Biochem. Z.* 88, 1-12(1918); *J. Chem. Soc.* 114, I, 464-5.—Exts. of incompletely autolyzed organs are more active as "antigens" in the Wassermann reaction than are exts. of the fresh organs. If autolysis, however, proceeds too far, the exts. become inactive. Neither the fraction sol. in alc., but insoluble in ether (soaps), nor the fractions sol. in alc., ether and acetone (fatty acids, fats, and cholesterol) of either fresh or autolyzed livers give a reaction as marked as the whole ext. The fraction from the fresh organs containing the lipoids gives as good results as the whole ext. of the partly autolyzed organ. The best reaction, however, is obtained by a mixt. of the lipoid fraction with equiv. amts. of the fraction containing the soaps, fatty acids and cholesterol. Treatment of the organ with trypsin or steapsin destroys its power of giving antigens; this function of the organs is not, however, altered by their treatment with pepsin-HCl, ricin-lipase, or with dil. acid or alkali.

C. J. WEST.

Effect of feeding sugar upon the esterase content of the blood serum and organs in phosphorus poisoning. J. P. SIMONDS. Northwestern Univ. Med. School. *J. Exp. Med.* 28, 663-72(1918).—Clear, filtered glycerol exts. of chopped liver, spleen or kidney contain an esterase. The esterase content of exts. of liver and spleen of the normal dog is reasonably const. It does not appear to vary to any great extent from the normal in poisoning with  $\text{CHCl}_3$  and P. Feeding large quantities of sugar and increasing the amt. of glycogen in the liver is accompanied by a marked increase in the esterase content of that organ. This increase is also evident in P-poisoned animals which have been fed a large amt. of sugar. The feeding of sugar does not prevent the increase in esterase in the blood serum of animals poisoned with P. The esterolytic power of exts. of the kidney varies considerably in different dogs. C. J. WEST.

The peptolytic power of liver, spleen, and kidney in poisoning with phosphorus and chloroform. J. P. SIMONDS. Northwestern Univ. Med. School. *J. Exp. Med.* 28, 673-9(1918).—Glycerol exts. of liver, spleen and kidney contain an ereptic enzyme capable of splitting peptone into amino acids. Poisoning with P appears to reduce this ereptic power of the liver and to a less extent that of the kidney. Poisoning by  $\text{CHCl}_3$  appears to have no appreciable effect upon the ereptase content of these organs. Feeding of sugar to normal animals has little or no effect upon this power, but feeding before and after P poisoning appears to prevent the reduction of ereptic power of the liver. C. J. WEST.

The phosphorus in organic combination in human urine. Observations in acute yellow atrophy of the liver. JOH. FEIGL. *Biochem. Z.* 89, 126-34(1918); *J. Chem. Soc.* 114, I, 514.—This is chiefly a review of the literature and of methods.

C. J. WEST.

**Studies in cholelithiasis. I. The disturbances of the cholesterol metabolism as a factor in gallstone formation.** M. A. ROTHCHILD AND A. O. WILENSKY. *Am. J. Med. Sci.* 156, 239-47(1918).—A summary of the knowledge of cholesterol metabolism. The principal data on bile chemistry have been derived from studies on pathological cases. Normal bile, as detd. by R. and W., contains 20-80 mg. cholesterol per 100 cc. bile. In hypercholesterolemia, 850 mg. bile cholesterol percent may occur. Blood cholesterol in normal cases was found by these investigators to be 150-80 mg. %. A fairly definite relation was found to exist between food and cholesterol content of bile and blood. A review is given of the present state of the theories of cholesterol concretion formation, cholesterolemia and pregnancy and bacterial factors. II. The clinical relationships of the cholesterolemia to the pathological process. ABRAHAM O. WILENSKY AND MARCUS A. ROTHCHILD. *Ibid* 404-14.—A study of 70 cases. Normal blood cholesterol was found in a variety of diseases involving calculi, incomplete bile-duct obstruction, empyema of the gall-bladder, etc. Owing to the influence of diet, diseases such as nephritis, diabetes, atherosclerosis, pregnancy, etc., the cholesterol content varies. In heightening the blood cholesterol figure, it is not possible to utilize cholesterol as a diagnostic factor, except rarely as in differentiating between jaundice due to biliary obstruction and that caused by cirrhosis of the liver.

WITHROW MORSE.

#### H. PHARMACOLOGY.

ALFRED N. RICHARDS.

**Trinitrotoluene poisoning with a record of five cases.** ALBERT WM. GREGORSON. London. *Glasgow Med. J.* 8, 65-78(1918).—A jaundice is caused which resembles the jaundice of acute liver atrophy. There is a reabsorption of bile which causes a severe anemia, fall in % of hemoglobin and extreme polymorphonuclear leukopenia. Toluyl-enediamine is the active agent producing the jaundice. In some cases the principal paths of absorption were the lungs and stomach. The poisoning produces first gastrointestinal disturbances and peripheral neuritis followed by headache, anemia and jaundice.

F. HULTON-FRANKEL.

**The antagonistic action of salts.** L. W. H. VAN OYEN. *Biochem. Z.* 87, 418-24 (1918); *J. Chem. Soc.* 114, I, 472.—A preliminary account is given of attempts to correlate physical properties of salts in soln. with their biological action. It is shown that Cl is adsorbed less by various adsorbents from solns. containing Na, K, and Ca chlorides than from a soln. of NaCl alone. The proportions of the various cations in the expts. were those used by Osterhout in his biological expts. Expts. are also described on diffusion of Cl through a dialyzer from solns. of NaCl alone or mixed with KCl and CaCl<sub>2</sub>.

C. J. WEST.

**The biological action of convolvulin and jalapin.** G. HEINRICH. *Biochem. Z.* 88, 13-34(1918); *J. Chem. Soc.* 114, I, 467.—These substances are like the saponins and agaricin in that they exert a hemolytic action when they are in neutral soln. They are very sensitive to alkalis, however, and rapidly lose the hemolytic action in the presence of a slight excess of alkali. The hemolytic action could only be demonstrated *in vitro*, but not *in vivo*, as no blood appeared in the urine after intravenous or subcutaneous injection. Neither was any purgative action observed. They are both specific poisons for fish. For purgative action, direct contact of the glucosides with the mucous membranes of the intestines is necessary. This action is also lost when the substances are treated with alkali and the hemolytic action can therefore be used in testing the value of the preps. as drugs. They are less sensitive to the action of mineral acids, as, in spite of the hydrolysis which ensues, the purgative action is not lost. In this respect, they are similar to the saponins. Like the saponins, they are only incompletely resorbed in the alimentary tract and appear unchanged in the feces.

C. J. WEST.

**Influence of temperature on the capillary activity of narcotics.** B. VON ISSERKUTZ. *Biochem. Z.* 88, 213-8(1918); *J. Chem. Soc.* 114, I, 467-8.—Temp. alters the narcotic activity of indifferent narcotics in the same direction as it alters their capillary activity. Increase and decrease of the narcotic activity of the 6 substances investigated by H. H. Meyer can be ascribed not only to the differences produced in their distribution between  $H_2O$  and org. solvents on warming, but also to increase or decrease of their capillary activity. In the case of other poisons, increase of temp. can cause diminution of capillary activity, while their potency is enhanced. C. J. WEST.

**Narcosis and oxygen concentration.** B. VON ISSERKUTZ. *Biochem. Z.* 88, 219-31 (1918); *J. Chem. Soc.* 114, I, 462-3.—The action of narcotics is independent of the O concn., and there is no marked difference in their action on tadpoles in water rich and poor in O. During narcosis the O respiration of tadpoles diminishes from 18 to 40%. Ethylurethan and alc. in narcotizing doses cause the same amt. of diminution. KCN diminishes O respiration to the extent of 30-40% without causing paralysis. Increased partial pressure of O can increase O respiration of the tadpoles without inhibiting the action of narcotics; in fact, the O consumption of the animals under deep narcosis in water rich in O is greater than that of the non-narcotized animals in water with the normal amt. of O. C. J. WEST.

**Action of chlorates on the blood of man and certain animals.** EGBERT CAESAR. *Biochem. Z.* 89, 1-26(1918); *J. Chem. Soc.* 114, I, 512.—Details are given as to the concns. in which  $KClO_3$  exerts an injurious effect on the blood, giving rise to the formation of methemoglobin. The general conclusion is drawn that  $KClO_3$  can act toxically when taken *per os* and that it should not be used indiscriminately in tooth powders and analogous preps. The astringent action of  $Al(ClO_3)_3$  is due to the Al ion. A detailed criticism is given of a commercial prepn. of chlorates, known as Mallebrein's. C. J. WEST.

**Action of pilocarpine on respiratory metabolism and the gas content of the blood.** G. KELEMAN. *Biochem. Z.* 89, 135-55(1918); *J. Chem. Soc.* 114, I, 511.—The increased secretory activity of the salivary glands produced by pilocarpine is accompanied by an increased metabolism of energy (about 10%). There is also produced at the same time an increased  $CO_2$  content in the blood, both venous and arterial. There is no evidence, however, of an increased "secretion" of  $CO_2$  by the blood. C. J. WEST.

**The biochemical behavior of aminomethyl hydrogen sulfite.** E. SALKOWSKI. *Biochem. Z.* 89, 178-98(1918); *J. Chem. Soc.* 114, I, 514.— $H_2NCH_2OSO_2H$  yields HCHO in distn. of an aq. soln. and also, but very slowly, when it is kept in  $H_2O$  at ordinary temp. Expts. with urine and meat indicate that it is of little value as an antiseptic. No HCHO could be detected in the urine after the administration of the acid to a rabbit. When administered to a dog, part appears, from the increase of the neutral S in the urine, to be excreted unchanged. Indican disappears from the urine during administration and this fact seems to indicate that the sulfite acts as an intestinal antiseptic. C. J. WEST.

**The influence of temperature on the strength of action and surface activity of narcotics.** RUDOLF UNGER. *Biochem. Z.* 89, 238-78(1918); *J. Chem. Soc.* 114, I, 515.—The influence of changes of temp. on narcotic activity of various substances such as chloral hydrate, salicylamide, benzamide, nomaactin and EtOH was investigated, the subjects of the expt. used being tadpoles, the fish *Leuciscus*, and the sciatic nerve of frogs. In some cases, increase of temp. increased and in others it diminished narcotic activity. These changes could not always, however, be correlated with changes in the distribution of the narcotic between oil and water, as would follow from the Overton-Meyer theory, or with the change in surface tension of the solns.

Account has to be taken in investigations of this character of the effect of temp. changes on the general metabolic activity. C. J. WEST.

**The influence of atropine on respiratory metabolism and the blood gases.** GEORGE KELEMAN. *Biochem. Z.* 89, 338-49(1918); *J. Chem. Soc.* 114, I, 511.—There is a marked diminution of the respiratory metabolism of dogs after intravenous injection of atropine, which effect can be antagonized by the simultaneous injection of pilocarpine. The increased gaseous metabolism produced by pilocarpine can be diminished by atropine and the diminished gaseous metabolism produced by the latter alkaloid can be increased by the subsequent injection of the former. The content of the blood in  $\text{CO}_2$  is diminished by injection of atropine. This diminished output of  $\text{CO}_2$  produced by injection of atropine, already mentioned, is due, therefore, not to a diminished secretion of this gas by the lungs but to a general diminution of its production.

C. J. WEST.

**Relative irritant properties of the chlorine group of antiseptics.** G. E. CULLEN AND F. D. TAYLOR. Rockefeller Inst. *J. Exp. Med.* 28, 681-99(1918).—The use of the ears of rabbits is proposed in testing the irritant effect of antiseptics. It is necessary, because of individual variations, to use solns. having definite irritant actions as constants. 0.5%  $\text{NaClO}$  solns. have minimum irritant effects over a range of alkalinity of from about 100 to 1000 times that of  $\text{H}_2\text{O}$  ( $p_{\text{H}}$  above 9-10). Solns. may be adjusted within these limits by use of endpoints of powdered phenolphthalein or of alc. solns. of *o*-cresolphthalein or phenolphthalein.  $\text{NaClO}$  solns. kept within the above range by either borate or carbonate buffer salts (Dakin soln.) show the same irritant effect, whether made from  $\text{Ca}(\text{OCl})_2$  and  $\text{Na}_2\text{CO}_3$ , from  $\text{Cl}$  and  $\text{Na}_2\text{CO}_3$  or electrolytically. Solns., however, that have an alkalinity of less than that indicated by the endpoint to alc. phenolphthalein ( $p_{\text{H}}$  8.5-8.8) or greater than that indicated by the endpoint to powdered phenolphthalein are intensely irritating. 0.5%  $\text{NaClO}$  solns. from which most of the  $\text{Ca}$  has been pptd. or  $\text{Ca}(\text{OCl})_2$  solns. of equiv.  $\text{HOCl}$  concn. are only slightly irritating. 2% chloramine-T soln. has no irritant action. 5% dichloramine-T in chlorosane or chlorosane alone irritates rabbit ears to a slight degree only.

C. J. WEST.

**Action of chlorinated antiseptics on blood clot.** H. D. TAYLOR AND M. G. STEBBINS. Rockefeller Inst. *J. Exp. Med.* 29, 125-31(1919).—Chlorinated antiseptics have no power to penetrate blood clots and destroy bacteria contained therein.

C. J. WEST.

**Effects of various systemic agents on superficial hemorrhage.** PAUL J. HANZLIK. Western Reserve Univ. *J. Pharmacol.* 12, 119-28(1918).—The most effective hemostatic agent on superficial bleeding by systemic (intravenous) administration was adrenaline; tyramine somewhat less; pituitary ext. was variable. Fatal doses of ergot and digitalis (1 expt. each) also lessened and arrested, respectively, the bleeding. The effects of the following systemically on bleeding are roughly parallel to the changes in blood pressure: coagulen (Ciba), cephalin (Howell), thromboplastin (Squibb), horse serum, stypticin, gelatin, saline, emetine and possibly peptone. Nitrite and hydrastis increased bleeding with a fall in blood pressure. The results with the thromboplastic agents might be different with prolonged administration.

C. J. WEST.

**Effects of various agents on superficial hemorrhage and the efficiency of local hemostatics.** PAUL J. HANZLIK. Western Reserve Univ. *J. Pharmacol.* 12, 71-117(1918).—Beginning with the most efficient, the order of efficiency of the more important of all the hemostatic agents tested is adrenaline, pituitary ext., tyramine, acetic acid,  $\text{FeCl}_3$ , quinine-urea-hydrochloride, tannin,  $\text{NaHCO}_3$ ,  $\text{BaCl}_2$ , cane sugar,  $\text{NaCl}$ . A no. of other agents, which were tried, can lessen local hemorrhage in variable

degrees, but on the whole they are inferior and undesirable for various reasons. The following, among the more important of this class and for which hemostatic claims have been made, were found to increase bleeding on local application: cotarnine salts (stypticine and styptol), antipyrine, peptone, emetine, sometimes alum. Orthoform (1% soln.) also quite markedly increased local bleeding. Under the conditions, cephalin, coagulen and thromboplastin were all variable, or did not affect the course of bleeding.

C. J. WEST.

## I. ZOÖLOGY.

R. A. GORTNER.

Pigmentation of a clypeastroid, *Mellita sesquiperforatus* Leske. W. J. CROZIER. Bermuda Biol. Sta. *Am. Nat.* 52, 452-6 (1918).—Detailed reports of expts. with this organism are given. "Evidence afforded by intracellular substances capable of behaving as indicators of acidity, shows that the tissues of marine animals are much more acid (less alk.) than sea water." The green color is produced when the tissue fluids become more alk. than usual.

L. W. RIGGS.

Toxic action of potassium cyanide and its relation to the state of nutrition and age of the cell as shown by *Paramecium* and *Didinia*. BARBARA LEE LUND. *Biol. Bull.* 35, 211-31 (1918).—The following summary is given: An attempt was made to discover what factor or factors are responsible for the observed differences among individuals of a pure line of *Paramecia* and *Didinia* living in the same culture medium, e. g., hay infusion. What are the differences in a protozoan cell which cause differences in response to apparently identical external conditions at different times? Survival time (resistance) of these organisms in solns. of KCN was selected and used as an index because of the generally supposed relation of the toxic action of KCN and the rate of oxidation in cells. All data on survival time were obtained by observation on individual cells and not by estg. the av. survival time of large numbers of the cells, as is usual in such expts. In this way the variation in resistance of the cell at different times during the period between cell divisions was followed accurately and is summarized by curves. The cessation of movement of *Paramecium* is a less variable endpoint than cytolysis for detg. the death point in KCN solns. *Paramecia* can be cultivated in pure line mass cultures in tap water when fed compressed yeast. In this way the chem. compn. of the medium and food can be kept more const. than has been possible previously in work on *Paramecium*. Resistance of *Paramecia* to KCN when allowed to feed on bacteria shows a marked increase, and when fed on yeast the resistance increases to a smaller degree from the time of division up to the following division. The resistance of *Didinia* to KCN when fed with *Paramecium* increased from the time of completion of division until a max. was reached sometime previous to the second division, and then gradually fell before the second division. This rhythm is directly comparable with that found by Lyon and others in echinoderm eggs (cf. C. A. 5, 1921). When *Paramecia* and *Didinia* are prevented from obtaining food the resistance to KCN gradually decreases below its value at the completion of division. Starvation of sister cells of *Didinia* results in a decrease in difference of survival time in KCN. This original difference in sisters is apparently due to the fact that the food content is not always distributed equally to the daughter cells at division. In *Paramecium* the distribution of food is practically equal, and here the av. difference in survival time between sisters is the same immediately after division as it is after a period of 24 hrs. The differences noted above are attributed to a change in the permeability of the cell. Penetration of KCN into the cell and hence its toxic action as a measure of survival time, is dependent upon the permeability of the cell at different times. On this assumption rhythm in susceptibility depends primarily upon rhythm in permeability.

L. W. RIGGS.

**The influence of oxygen on metabolism. I. Experiments on meal-worms.** TORBJORN GAARDER. *Biochem. Z.* 89, 48-93(1918); *J. Chem. Soc.* 114, I, 512.—The metabolism of the *Tenebrio chrysalis* is independent of the O tension of the atm. as long as the O tension of the tissues is positive. As the O tension of the atm. sinks, the gradient between the O tension of the tissues and the atm. remains const. until the former tension becomes zero. With further diminution of the tension of the O of the atm. beyond this point, the gradient of O tension between the tissues and atm. sinks, and the O consumption of the chrysalis diminishes. Numerous numerical data are given in support of these statements. The expts. were carried out by means of a modified micro-respirator of Krogh. If the chrysalis is allowed to remain in an atmosphere so poor in O that the metabolism is subnormal, certain anaerobic processes take place. On removing the animal to an atm. of normal O content, the metabolism remains subnormal for some time; it then increases and becomes greater than normal. This is apparently due to the destruction of products formed during the anaerobic conditions.

**II. Experiments with carp.** *Ibid* 89, 94-125; *J. Chem. Soc.* 114, I, 512-3.—An app. is described for passing water with known O content through gills of fish and estg. the consumption. It is found that there is very slow increase in O consumption with increasing tension of the O dissolved in the water. The increase is so small that the conclusion is drawn that the changes in O tension in water which take place normally are without any appreciable effect on the metabolism. There is a linear relationship between O consumption and the O tension of the water passing the gills; that is, the O consumption is in accordance with laws governing the absorption of gases by a liquid and the increase of the consumption can be explained by assuming that the oxygen dissolved physically in the blood is utilized.

C. J. WEST.

## 12. FOODS.

W. D. BIGELOW and F. F. FITZGERALD.

**Influence on health of antiseptics added to food products.** T. J. RUMI. *Anales soc. quim. Argentina* 6, 210-4(1918).—R. discusses a paper by P. Brouardel. In considering this question it is not always sufficiently kept in mind that certain preservatives ingested with food in small daily amts. for a long time may by their toxicity produce symptoms quite distinct from those which ensue after a limited no. of medicinal doses in larger amt. The matter must, furthermore, be decided on the basis of the total daily amt. ingested regardless of the proportion, however small, of preservative which may be present in any given food product. The fixing of a max. legal proportion of preservatives, as suggested by certain food interests, is not feasible in view of the fact that the min. toxic dose is dependent not only on the nature of the substance employed but also on such varying factors as the age, state of health, etc., of the individual. In view of the above and the fact that exact proof as to the cause of injury to health is often difficult in cases where there is strong probability that such injury to health is due to preservatives in food, R. concurs with B. that debated questions of injuriousness to health should be decided in favor of the public and that prohibition of the use of preservatives in foodstuffs should be more sweeping in character.

H. S. PAINÉ.

**Rules and regulations of the Secretary of Agriculture under the food products inspection law of Oct. 1, 1918.** ANON. U. S. Dept. Agr., Office of Sec., *Circ.* 120, 8 pp.

J. J. SKINNER.

**Utility of blanching food in food canning—effect of cold shock upon bacterial death rates.** EVA M. BRUETT. *J. Ind. Eng. Chem.* 11, 37-9(1919).—The belief is



disproved that cold shock after heating so injures the vitality of the bacteria as to make them more susceptible to subsequent heating. The organism used was *Bacillus pseudotetanicus* (Kruse) Migula. Several tables show that the velocity coeff. of the death rate of shocked and unshocked bacteria is nearly const. The value of blanching is the cleansing action of the process which leaves a smaller number of spores in the canned product.

DOROTHY B. SCOTT.

The determination of milk sugar. GRIMMER AND E. URBSCHAT. *Milchwirtschaft. Zentr.* 46, 257 (1917); *Biedermanns Zentr.* 47, 222-3 (1918).—Cow and goat milk were deproteinized by means of a colloidal  $\text{Fe}(\text{OH})_3$  soln. instead of  $\text{CuSO}_4$  as in the Ritt-hausen method, and the results of detns. of sugar were found to agree very closely with those obtained by use of  $\text{CuSO}_4$ . Twenty-five cc. milk are brought to 400 cc. with  $\text{H}_2\text{O}$  and the colloidal  $\text{Fe}(\text{OH})_3$  is added from a buret till the supernatant fluid, after settling of the ppt., appears clear and colorless. Ten cc. of cold satd.  $\text{NaF}$  soln. are added to the mixt. and the whole is diluted to 500 cc. After filtration sugar is detd. in 100 cc. by the usual Fehling method.

ALBERT R. MERZ.

Table for sorting of milk samples. L. J. HARRIS. *Analyst* 43, 375-7 (1918).—This table allows the analyst to see at a glance from the sp. gr. and total solids whether the milk is deficient in fat or solids-not-fat. The table is calcd. on Richmond's formula.

H. A. LEPPEL.

Additive factors for the calculation of fat in milk from the specific gravity and total solids. L. J. HARRIS. *Analyst* 43, 263-7 (1918).—In order to obtain rapidly where many routine samples of milk are analyzed H. submits two tables of factors for calcg. the fat when the total solids and sp. gr. are known. Formulas used in the prepn. of the table are given.

H. A. LEPPEL.

The reductase test in the service of cream production. A. E. SANDELIN. *Helsingfors. Molkerei-Ztg.* 27, 281-2, 290-1, 298-9 (1917); *Biedermanns Zentr.* 47, 140-3 (1918).—The reduction periods of the whole milk, skim milk and cream of test samples which were obtained and handled with the greatest possible protection against bacterial infection were detd. and their bacterial contents ascertained or calcd. Cultures were planted on gelatin with the fluids according to the method of Barthel and Orla-Jensen (*C. A.* 7, 1063, and *Kgl. Landbruks-Akad. Handl. Tid.* 1912, p. 13) kept at room temp. and counted after 7 days. The reduction periods were detd. according to the method of the same authors, using Blauenfeldt and Tvedes plates. Uniform distribution of acids was insured by previous vigorous shaking. The fat content of the whole milk and the cream was detd. according to Gerber, that of the skim-milk by Roesse-Gottlieb's method. The % of cream was calcd. by the formula  $x = (Vf - Mf) / (Rf - Mf)$ . ( $Vf$  = fat in whole milk,  $Mf$  = fat in skim-milk.  $Rf$  = fat in cream.) Knowing the % of cream and the bacterial content of the cream and the skim-milk, it can be calcd. how many of the bacteria present in the whole milk are obtained in the cream and how many in the skim-milk or what effect centrifuging had on the bacterial content. Of 30 tests the bacterial content of the cream was greater than that of the skim-milk in 12 cases, smaller in 16 and equal in 2. The bacterial content of the cream and skim-milk, as a close inspection of results and consideration of the sources of error shows, is dependent entirely on chance. The reduction period was longer for cream in 20 cases, shorter in 6 cases and the same in 4 cases as that of the whole milk. Differences between whole milk and cream were in most cases not great. The cause of the longer duration of the time of reduction with cream is ascribed to the influence of acids on the decoloration of methylene blue since the cream enriched with air bubbles gave the bacteria more acid to consume than did the whole milk, the self-reduction of the milk and the reducing substances produced by the bacteria not becoming effective till

later. Similarly with skim-milk, the acid-producing air is not excluded by a fat layer so that the time of reduction was longer in 26 cases and the same in but 4. Expts. showed that the relative bacterial content as well as the relative time of reduction of whole milk, cream and skim-milk was not changed by preservation 48 hrs. in sterilized bottles. The following conclusions are drawn: the quality of cream can be judged by means of the reductase test as well as can that of whole milk. This holds good for cream coming directly from the centrifuge as well as that kept 1 to 2 days. The reduction period of skim-milk is at times a little longer than that of whole milk, presumably because of the fact that there is no layer of cream on its surface to prevent access of air. The expts. furnish no support for the assertion that de-creaming by the centrifuge makes the cream richer and the skim-milk poorer in bacteria. No obvious effect of centrifuging on the division of bacteria could be observed. ALBERT R. MERZ.

**New method for the analysis of butter.** PAUL ERCULISSE AND HENRI DACKWEILER. *Ann. chim. anal.* 23, 225-34(1918).—Proposals are made for the modification of the following numbers in the analysis of butter: (1) sapon. or Koettstorfer no., (2) volatile, sol. acids or Reichert-Meissl-Wolny no., (3) insol. volatile acids or Polenske no., (4) fixed fatty acids or Hehner no. A brief outline of the methods proposed and their advantages are given. LOTTIE M. MANROSS.

**Nematode galls as a factor in the marketing and milling of wheat.** D. A. COLEMAN. U. S. Dept. Agr., *Bull.* 734, 16 pp. (1918).—Black gall resulting from the infection of wheat heads by the nematode (*Tylenchus tritici*) is encountered as a new foreign material in marketing wheat. It has a limited distribution, occurring only in Virginia and California. Chem. analysis of the nematode gall wheat shows that the N-free ext., which in the normal wheat berry consists mostly of starch grains, has been greatly reduced. The crude fiber, crude protein, ash and fat have been largely increased. The acidity of the whole wheat berry has been raised 10 times above that of sound wheat. Starch grains are almost completely absent. Whether the nematodes consumed the starch or whether their presence in the plant resulted in physiol. disturbance precluding starch formation was not detd. The lack of starch in the wheat results in a lower flour yield. The presence of nematodes will increase the percentage of lower grade flour. The loaf made from flour containing the ground galls was inferior in color and had a dark gray crumb. The infected grain when used for planting can be cleaned by immersing seed for 10 to 15 min. in H<sub>2</sub>O at a temp. of 135°. The galls can also be floated out in cold H<sub>2</sub>O, as they are lighter than sound wheat kernels, the difference in wt. being made use of in its sepn. J. J. SKINNER.

**Determination of cellulose in wheat.** V. HASENFRATZ. *Compt. rend. soc. biol.* 81, 457-8(1918).—Five ~~g~~ finely ground wheat and 150 cc. HCl (21.3 g. per l.) were boiled under a reflux condenser for 20 mins.; the residue and 100 cc. KOH soln. were boiled under a reflux condenser for 15 mins. The final residue was then washed with boiling H<sub>2</sub>O (to disappearance of alk. reaction), abs. alc. and Et<sub>2</sub>O, dried and weighed. Native (French), Australian and Manitoba wheats were treated in this manner and the alk. soln. used in various detns. contained 10, 25, 50, 75 and 100 g. per l., resp. The proportion of "cellulose" thus detd. decreased progressively as the concn. of the KOH soln. increased. The max. and min. values for French, Australian and Manitoba wheats were 2.48 and 1.52, 2.76 and 1.68, 3.02 and 1.86%, resp. The relations between the min. and max. values for French, Australian and Manitoba wheats were 1:1.63, 1:1.64 and 1:1.62, resp., thus showing remarkable constancy for the different samples. H. raises the question whether this relationship between these min. and max. values is const. regardless of the kind and origin of wheat and whether a different but const. ratio could be found for other cereals, thus giving this relationship a sp. character.

H. S. PAINE.

**The determination of the moisture content of flour.** F. T. SHUTT AND P. J. MOLONEY. *Trans. Roy. Soc. Canada* 11, III, 101-6(1917).—In detg. the moisture content of flour, satisfactory results were obtained by heating at 100° for 5 hrs. in a Freas electrically heated vacuum oven in which a steady vacuum of 29.5 in. was maintained. Portions of samples approx. 2 g. each were weighed to 0.1 mg. into Al dishes 4.5 cm. diam., 2 cm. in depth. Triplicates showed close checks such as 12.66, 12.67 and 12.64%. Lower results were obtained by heating at atm. pressure in a Freas elec. oven at 100° or in a double-jacketed water oven heated by gas. The temp. of the latter was about 98°, and a period of at least 48 hrs. was required to bring to const. wt. It is shown that the difference in results, comparing those obtained from the vacuum oven with those from the air ovens, is not to be accounted for by any oxidation of the flour, as was at first suspected. Samples dried in the vacuum oven at 100° apparently took up moisture after being transferred to the air oven, being heated therein at 100°. Evidently the ovens operating under atm. pressure are inefficient in drying flour samples. The figures from the vacuum oven are obtained more quickly, are more consistent and represent more nearly the absolute moisture content of the flour. H. M. LANCASTER.

**The chemical composition of wheat, rye and corn germs.** H. KALNING. *Z. ges. Getreidew.* 9, 167 (1917); *Biedermanns Zentr.* 47, 114-6(1918).—The carefully cleaned germs contained dry-matter: wheat, 91.17%; rye, 84.49%; corn, 90.65%. The dry matter contained:

|                                                           | Wheat germs.  | Rye germs.   | Corn germs. |
|-----------------------------------------------------------|---------------|--------------|-------------|
| Ash.....                                                  | 5.50%         | 5.54%        | 6.05%       |
| Fat.....                                                  | 12.00         | 11.95        | 24.36       |
| Protein.....                                              | 40.75         | 44.74        | 15.11       |
| Crude fiber.....                                          | 2.50          | 3.94         | 5.76        |
| N-free ext.....                                           | 39.25         | 33.83        | 48.72       |
| Pentosans.....                                            | 11.55         | 7.32         |             |
| Starch (Ewers).....                                       | 13.00 approx. | 6.00 approx. | 24.75       |
| P <sub>2</sub> O <sub>5</sub> .....                       | 2.52          | 3.11         |             |
| % P <sub>2</sub> O <sub>5</sub> H <sub>2</sub> O-sol..... | 65.10         | 56.30        |             |
| Reducing sugar.....                                       | 4.07          | 6.66         |             |
| Sugar after inversion.....                                | 18.56         | 22.62        | 8.00        |
| H <sub>2</sub> O-sol. protein.....                        | 19.76         | 21.55        |             |
| Alc.-sol. protein (60% alc.).....                         |               | 5.55         |             |
| Aq. ext.....                                              | 34.61         | 51.44        |             |

The large starch content of the corn germs is to be attributed to the fact that they cannot be sepd. as well in milling as the others. A number of cleavage products such as allantoin, betaine, choline and lecithin were found in the wheat germs. Comparison of nutritive values according to König's method (nitrogenous matter × 5, fat × 3, carbohydrate × 1) gives rye first place with 293, wheat, 279 and corn 197. Comparative digestibility expts. by Honcamp using sheep and swine gave high digestion coefficients which are given in a table. It is concluded that the most important food elements are accumulated in germs in especially high amts.

ALBERT R. MERZ.

**A preliminary study of the bleaching of oats with sulfur dioxide.** G. H. BASTON U. S. Dept. Agr., *Bull.* 725, 11 pp.(1918).—It is shown that it is possible to bleach weather-stained, discolored and damaged oats, giving them the appearance of natural oats of good quality. The viability of oats is greatly reduced by S bleaching and the bleached oats are not safe to use for seed.

J. J. SKINNER.

**Banana flour and other flours from tropical starchy products with notes on banana cultivation.** B. J. EARRON. *Agr. Bull. Fed. Malay States* 6, 430-6(1918).—Com-

parison of analysis of banana flour with flours of cereals as well as a discussion of its nutritive value, its prepn. and use. H. A. LEPPER.

**Physical chemistry of bread making.** E. J. COHEN AND L. J. HENDERSON. *Science* 48, 501-5(1918).—To get good dough the fermentation and acidity must be controlled. This fermentation is decreased by addition of salt or by using less yeast, but is increased by its own activity, which increases the acidity of the dough and makes it rise more rapidly. The acidity of the dough is the most important variable factor. Acidity may be increased by adding more acid or prolonging the process of fermentation. Bread must be baked at the right time so that right amt. of  $\text{CO}_2$  may be retained. Wheat flour dough is more tenacious and elastic than flours from other grains, the latter do not retain the gas. Presence of substitutes makes yeast less active and dough less acid. Serum proteins may be added as substitute for gluten of wheat. Rope occurs often in summer and in low acidity. Proper acidity may be shown by development of full red color when methyl red is put on slice of bread.

LOTTIE M. MANROSS.

**Control of rope in bread.** E. J. COHN, S. B. WOLBACH, L. J. HENDERSON AND P. H. CATHCART. *J. Gen. Physiology* 1, 221-30(1918).—Rope is a condition of bacterial decompn. of bread which leads to a peculiar slimy or ropy consistency of portions of the interior of the loaf, produces an odor resembling ensilage, and renders the loaf unacceptable. *B. mesentericus* was identified from a ropy loaf and inoculation with it produced ropiness. The development of rope from this bacillus depends upon the existence of a H-ion concn. in bread sensibly less than  $10^{-5}$  N. This condition is likely to exist in war bread or other breads containing other than wheat flour. The addition of acids will prevent ropiness. The growth of yeast tends to produce a very acid reaction and prevents the development of *B. mesentericus*. Methyl red, when colored red, indicates the reaction to be acid enough to prevent ropiness. H. A. LEPPER.

**The utilization of some nuts as food.** F. A. CAJORI. Yale Univ. *J. Home Econ.* 10, 304-11(1918).—Metabolism expts. on the utilization of the N in protein-rich nuts, and on the utilization of the carbohydrates and proteins of the chestnut, litchi nut and coconut. Various nuts were added to a uniform diet given to men and to dogs. The dietary intake was made sufficient for the calorific needs of the subjects. The "coeff. of digestibility" of the N in the various diets was as follows: almond 84-89, almond paste 88-89, peanut 81-85, peanut paste 90-92, pecan 83-84, pecan paste 81-83, pine 89, English walnut 83, coconut 87-89, litchi 81-82, brazil 88. A basal diet gave 84-90. L. D. ELLIOTT.

**Calcium oxalate in the dasheen.** O. F. BLACK. *Am. J. Botany* 5, 447-51(1918).—The experimental evidence submitted shows that  $\text{CaC}_2\text{O}_4$  crystals cause the acrid taste of the dasheen by the mechanical irritation of the mucous membrane of the mouth. The dasheen synthesizes  $\text{CaC}_2\text{O}_4$  in the form of "raphides." Such crystals when mixed with paraffin and taken in the mouth produce a similar sensation. The acrid flavor of dasheen can readily be removed by proper methods of cooking. J. J. SKINNER.

**The preservation of potatoes, especially by means of "megasan."** L. HILTNER. *Praktische Blätter für Pflanzenbau und Pflanzenschutz* 15, 66-0(1917); *Biedermanns Zentr.* 47, 125-8(1918).—"Megasan" is a manufd. prepn. consisting mainly of Na boroformate which slowly evolves formic acid and is claimed to destroy putrefactive fungi and prevent decay. Megasan II contains talc, megasan III contains washed kieselguhr and megasan K is a solid soln. of Na boroformate in ignited kieselguhr. Comparative expts. of the effect of megasan III and of S,  $\text{CaO}$ ,  $\text{CaCO}_3$ , gypsum, chaff, saw-dust and peat mull on the preservation of potatoes kept over winter in wooden boxes in a cellar show that only saw-dust and peat mull brought about a pronounced

decrease of decay. Best results were obtained from the latter. Treatment with megasan III actually increased the % of decayed tubers.  $\text{CaO}$ ,  $\text{CaCO}_3$  and gypsum caused very high losses in wt. which is apparently not due altogether to loss of  $\text{H}_2\text{O}$ . Other investigators have had good results with megasan K. This has the power of absorbing  $\text{H}_2\text{O}$  and drying the air in the heap and H. questions the benefits as derived from the formic acid. Further work is in progress on the detn. of the cause of the losses in wt. and with the use of megasan K.

ALBERT R. MERZ.

Teas of commerce. INES PIEROTTI. Univ. La Plata. *Anales soc. quim. Argentina* 6, 329-43(1918).—P. reports analyses of a large no. of teas from various sources. The min. and max. values (as %) for various detns. were as follows: loss of wt. at  $100^\circ$ , 6.699, 9.974; ash, 5.421, 6.091; aq. ext., 24.046, 38.993; total N, 3.501, 4.399; matter sol. in  $\text{CCl}_4$ , 0.502, 2.546; matter sol. in  $\text{CHCl}_3$ , 1.110, 5.881; matter sol. in  $\text{EtOH}$ , 3.314, 15.186; theine, 2.071, 3.646; dextrin and gums, 4.044, 6.967; protein, 22.568, 27.493; cellulose, 11.944, 14.933; tannin, 9.092, 14.553. Dextrins and gums were detd. by pptn. with alc., theine by the Grandval and Lajoux method, and tannin by the method of F. Jean. Cellulose was detd. in the residue remaining after treatment with  $\text{CCl}_4$ ,  $\text{CHCl}_3$  and  $\text{EtOH}$ .

H. S. PAINE.

Criticism of the volumetric ferric chloride method proposed by Sabatini for determining the purity of maté (*Ilex paraguensis* St. Hil.). LUIS GUGLIALMELLI AND CARLOS GUERRERO ESTRELLA. *Anales soc. quim. Argentina* 6, 136-50(1918).—G. and E. have made a critical study of Sabatini's method (*C. A.* 12, 1218) which, according to the latter, is based on the reducing action of caffeine on  $\text{Fe}^{++}$  salts. The procedure recommended by S. was followed and samples of *Ilex paraguensis* from various localities (including portions of Brazil and Paraguay) were tested as were also various adulterants such as *Ilex dumosa* Reiss, *Ilex affinis* Gaertner, etc. S.'s procedure provides for a variation in which the concn. of the  $\text{Fe}_2\text{Cl}_6$  soln. used for titration, the wt. of material employed and the vol. of hot  $\text{H}_2\text{O}$  used for extn. are increased 10 fold. G. and E. tested both the original method and the variation and the aq. exts. obtained in both cases were titrated (1) while hot and (2) after cooling to room temp. Discordant results were obtained not only with respect to the original method and the variation, but also as regards hot and cold titration and *Ilex paraguensis* as compared with its adulterants. The discrepancy in results was found to be due in part to varying degree of hydrolysis of  $\text{Fe}_2\text{Cl}_6$  at different dilns. and temps. in the aq. soln., thus causing a variation in the vol. of added  $\text{Fe}_2\text{Cl}_6$  for which the reaction with  $\text{KSCN}$  first became perceptible. Expts. with aq. solns. of caffeine showed that this compd. has no reducing action on  $\text{Fe}_2\text{Cl}_6$ . The discordant results obtained with infusions of pure maté and its adulterants are attributed on the whole to hydrolysis of  $\text{Fe}_2\text{Cl}_6$  and reaction of the latter with polyphenols present in the plant infusions examd. The method proposed by Sabatini is regarded as having little value, although it might possibly, after some modification, be used for evaluating the polyphenols present in the plant exts.

H. S. PAINE.

Witgatboom. A substitute for chicory. J. McCRAE AND A. KLOOT. *Analyst* 43, 373-4(1918).—Roots of "witgatboom" (white-hole trees) are used as substitutes for chicory in South Africa. *Boscia transvaalensis*, Pest., *B. rehmanie*, Molrua *pedunculata*, Sim., and *Capparis albivernca* are the four most used. Analyses of the first and third named as well as botanical descriptions are given.

H. A. LEPPER.

Chemistry of certain mushrooms ("täublinge"). EMIL HERRMANN. *Pharm. Zentr.* 59, 73-5(1918); *Chem. Zentr.* 1918, I, 925.—A short compilation of present knowledge of the content in "täublinge" of acids, bases, carbohydrates, enzymes and coloring materials. [The term "täublinge" is applied to mushrooms derived from several species of *Lactarius* and *Russula*.—ABSTR.]

C. O. EWING.

**Odors of fungi.** E. HERRMANN. *Pharm. Zentr.* 59, 1-4, 7-10, 19-21(1918); *Chem. Zentr.* 1918, I, 840.—A comprehensive compilation of the odorous characteristics of some of the higher fungi, including a discussion of the relation between odor and edibility, and of the value of the odor as a means of identification. Cf. C. A. 10, 1767. C. O. EWING.

**The fruits of the moriche palm.** ANON. *Bull. Dept. Agr. Trinidad and Tolo* 17, Pt. 2, 104(1918).—A description of the palm. An analysis of the air-dry shell and kernels by A. E. Collens is reported. The dried kernels of the fruits are extremely hard and horny, resembling white ivory and they appear to be suitable for making artificial buttons, though subject to weevil attacks in tropical climates.

R. B. DEEMER.

**The composition and digestibility of reeds (*Arundo phragmites*) and rushes (*Scirpus maritimus*).** F. HONCAMP AND E. BLANCK. *Versuchsstationen* 90, 113-22 (1917); *Biedermanns Zentr.* 47, 225-6(1918).—These have been used in Germany as cattle food because of scarcity of feed. Analyses are given and the digestion-coeffs. secured by feeding to 3-yr. old sheep are reported.

ALBERT R. MERZ.

**Feeding experiments with dairy cows in Denmark.** A. V. LUND. Copenhagen. *Mitt. deutsch. Milchwirtschaft. Vereins.* 34, 172(1917); *Biedermanns Zentr.* 47, 230-2 (1918).—The results of comparative feeding expts. with beets and turnips are reported. Expts. with "cacao cake" indicate that it should be considered rather as a poison than a feed.

ALBERT R. MERZ.

**The losses involved in the preparation of dry hay and the production of silage.** J. AHR AND CHR. MAYR. Weihenstephan. *Fühlings landw. Presse* 66, 185-211 (1917); *Biedermanns Zentr.* 47, 69-78(1918).—The losses of dry matter occurring under the various conditions of the prepn. of hay on meadows were studied. The amt. of grass obtained from each exptl. plot was weighed immediately after mowing and an av. sample taken therefrom and immediately weighed. The content of dry matter was detd. in this sample after drying as rapidly as possible in an oven. After carefully drying the grass by one of the local methods of making hay the hay on each plot was weighed before harvesting and the content of dry matter again detd. in an av. sample. The amts. of dry matter in the fresh grass and the hay were calcd. from the data thus obtained and their difference represents the loss of dry matter. The hay was prepd. either by drying the grass on the ground or by hanging it up in "so-called hay-huts" which insured the crop as to quantity and quality. The 133 sep. expts. comprize 7 series. Observations on meadow fertilization expts. were carried on simultaneously with the detn. of losses. Series I, Pfaffanger, 1915: The effect of fertilization with  $P_2O_5$  and  $K_2O$  was shown by slight increases in the amt. of clover. N in addition to  $P_2O_5$  and  $K_2O$  increased the yields in the following order:  $NaNO_3$ ,  $(NH_4)_2SO_4$ ,  $CaCN_2$ . With complete fertilization, drying on the ground caused losses of dry matter as follows: with  $NaNO_3$ , 3.7%;  $(NH_4)_2SO_4$ , 4.6%;  $CaCN_2$ , 10%. Without N the loss was 11.9% and with no fertilizer at all the loss was 17%. The very great differences were explicable by the different compn. of the herbage. Series II, Muhlanger, 1915: The clover herbage was very slightly increased by unbalanced fertilization with  $P_2O_5$ . Unfertilized plots were almost devoid of clover.  $K_2O$ - $P_2O_5$  fertilization brought about the greatest increase in yield as well as an increase in the papilionaceous plants. N salts in addition to the  $P_2O_5$ - $K_2O$  somewhat lessened the crop yield and promoted the growth of the grasses with the suppression of clovers. The loss of dry matter was greatest with the N-free fertilization, less with simultaneous N fertilization and least with extensive suppression of clover, on plots having unbalanced fertilization with  $K_2O$  or  $P_2O_5$ . Series III, Schelter, 1915:  $K_2O$ - $P_2O_5$  fertilization brought about an increase of yield with simultaneous increase in the amount of clover. Differences in losses on drying were

very small. Series IV, Pfaffanger, 2nd cutting, 1915: There was complete absence of effect due to fertilization; also no differences in the relative amts. of the herbage. Series V, 2nd cutting, 1915, on plots of Series II: Unbalanced fertilization with  $P_2O_5$  increased the yield 800 kg. per ha.;  $K_2O$ , 500 kg. per ha. and  $K_2O-P_2O_5$ , 1600 kg. per ha. Clovers were increased in amount. N fertilization was unfavorable, least so cyanamide. Losses of dry matter in "hut-drying" and with full fertilization with  $(NH_4)_2SO_4$  and cyanamide were small. With "ground drying" the unfertilized plots showed least losses. Series VI, Pfaffanger, 2nd cutting, 1916: The previous year's fertilization with  $P_2O_5$  and  $K_2O$  showed good after-effects while the 3 N fertilizers failed to show any crop increasing effect. There were no significant differences in the composition of the herbage. "Detns. of losses of dry matter confirmed the results of Series V." Series VII, Muhllanger, 2nd cut, 1916: The previous year's fertilization with  $P_2O_5$  showed no noticeable after effect.  $K_2O$  produced an increased yield of 300 kg. per ha.  $K_2O-P_2O_5$  increased the 2nd crop by 400 kg. and the total yield of the year by 1550 kg. per ha. "Untergräser" and clovers predominated.  $NaNO_3$  increased the first cutting more than cyanamide. The differences in loss of dry matter for ground drying varied between 4.3 and 13.5% with the different kinds of fertilizer. Losses in drying are in general attributable to respiration and oxidation processes. Losses by respiration are less after wilting by exposure to the sun's rays, air-drying, heat and aeration. The assumption that the more digestible parts of the organic matter of highest value are concerned in the losses is justified. After harvesting, fermentation processes take place in storage according to the moisture content, ripeness, and composition of the herbage. Losses by fermentation in making silage can be limited to 10%.

ALBERT R. MERZ.

**Feed substitutes.** BALLAND. *Compt. rend. acad. agr. France* 4, 969-71(1918).—Analyses are reported of distillery malt (1 sample), beet flour (1), cacao bran (1), peanut meal cake (6), and carambola meal cake (2). The av. analysis of carob pods is also given. These contain 30 to 40% sugar and almost as much starch. Carobs are food for both man and beast.

ALBERT R. METZ.

**Utilization experiments with wooly seed meal, rumen mixture feed, horse chestnut refuse, bone feed meal, albumin economizing feed, Badersche meat meal, detanned leather scraps and horn meal.** A. MORGEN, C. BEGER, H. WAGNER, H. v. BREEREN, ELISA OHLMER AND J. MICHALOWSKI. *Landw. Verssta.* 89, 269(1917); *Biedermanns Zentr.* 47, 132-6(1918); cf. *C. A.* 11, 1702.—The expts. were conducted with sheep, using meadow hay as the main constituent of their food to which the above named feeds were added. Wooly seed meal (1) differs essentially from cotton seed meal only in a higher content of crude fiber. It is a very good source of protein for feeds. The animals must be gradually accustomed to it. Rumen feed (2) consists chiefly of the dried contents of rumens with some molasses and other additions. The water content should not be higher than 20% or it will deteriorate. It may be best compared with wheat bran. Horse chestnut refuse (3) is obtained in the manuf. of starch from horse chestnuts. Its value lies almost entirely in its N-free ext., as the protein is indigestible, and it contains only small amts. of fat and crude fiber. Bone feed meal (4) can be used only in small amts. because of its high content of mineral matter. Albumin economizing feed (5) consists mainly of gelatin with some bits of bone and a little horn. Badersche meat meal (6) is apparently made from the scraps which are obtained prior to the conversion of hide into leather. The crude protein consists mainly of gelatin or collagen. Detanned leather scraps (7) are said to be produced by a special process from the scraps of chrome-tanned leather reconverting them into the former raw hide. In external characteristics it resembles the Badersche meat meal but chemically more nearly the albumin economizing feed. Only traces of Cr were found. The horn meal (8)

gave poor results as a feed. Only 15% of its N was digested. Analyses of these feeds were as follows:

|                       | 1.    | 2.    | 3.    | 4.   | 5.    | 6.    | 7.    | 8.   |
|-----------------------|-------|-------|-------|------|-------|-------|-------|------|
| H <sub>2</sub> O..... | 10.62 | 19.79 | 10.96 | 3.00 | 12.12 | 14.91 | 10.60 | 4.2  |
| Crude protein.....    | 40.85 | 14.50 | 5.81  | 20.7 | 77.80 | 57.80 | 70.78 | 94.6 |
| Fat.....              | 8.00  | 2.90  | 3.71  | 3.2  | 0.31  | 14.45 | 3.20  | 0.6  |
| Crude fiber.....      | 17.39 | 12.81 | 15.38 |      |       |       |       |      |
| N-free ext.....       | 14.17 | 40.18 | 62.70 |      |       |       |       |      |
| Ash.....              | 7.97  | 9.82  | 1.44  | 63.8 | 8.65  | 9.05  | 8.70  | 1.2  |
| Org. matter.....      | 81.41 | 70.39 | 87.60 | 33.2 |       |       |       |      |

Coeffs. of digestibility are given for the different food elements. ALBERT R. MERZ.

**Coconut meal vs. cottonseed meal for dairy cows.** P. V. EWING AND E. R. SPENCE. Texas Agr. Expt. Sta., *Bull.* 225, 9 pp.(1918).—For economy of production of butter fat there was not much difference between feeding cottonseed meal, coconut meal and a mixt. of the two. Coconut meal feeding produced on the av. 0.2% more of butter fat. It is not as palatable as cottonseed meal and often becomes rancid.

J. J. SKINNER.

The foodstuff content of various brewery yeasts and of mineral yeast (MEYER) 16.

**Fats in powdered form for use in foods.** F. C. ATKINSON. U. S. 1,286,903, Dec. 10. A fat is melted, mixed with an active constituent of baking powder such as KH tartrate and the mixt., while hot, is sprayed into a chamber in which the temp. is below the congealing point of the fat. The powdered product may then be mixed with NaHCO<sub>3</sub> to form a baking powder.

**Baking powder.** F. C. ATKINSON. U. S. 1,286,904, Dec. 10. Hydrogenated corn oil is used for coating NaHCO<sub>3</sub> or other constituents of baking powder according to the method of U. S. pat 1,286,903 (*supra*).

**Deodorizing cream.** J. PRISKEY. U. S. 1,286,404, Dec. 3. Compressed air is forced into the cream through a body of hollow porous material immersed in it.

**Flour and meal.** J. SLEEMAN. Brit. 119,923, Oct. 26, 1917. In a process of preparing flour and meal from fruits, roots, vegetables, berries, and the like, the materials, after washing if necessary, are sliced or pulped, the liquid portion being expressed if necessary, and the slices further dried until the moisture is reduced to between 5 and 12%. The dried material is then ground and sifted. The coarser particles are used as cattle food, while the finer flour may be mixed with flour or malt, or with wheaten flour or the like. The expressed liquid may be fermented and converted into spirit, for potable or power purposes, or may be used for the extn. of sugar or starch. Cf. 21,038, 1892, 2,981, 1903, 26,794, 1905, 1,074, 1909, 16,651, 1909, 17,723, 1913 (C. A. 9, 339), and 8,371, 1915.

#### 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**Graphic representation of the chemical composition of natural waters.** ENRIQUE HERRERO DUCLOUX. *Anales soc. quim. Argentina* 6, 102-7(1918).—The system proposed is based on the classification of the analytical data into 2 groups, i. e., (1) those which refer to the saline compn. and (2) those which serve as an index of potability. The data of group 1 are composed of detns. of 6 electropositive and 6 electronegative radicals (calcd. as ions), viz.: SiO<sub>3</sub>, SO<sub>4</sub>, CO<sub>3</sub> (also CO<sub>3</sub>H and CO<sub>3</sub>), Cl, NO<sub>3</sub>, SH, Fe,



Al, Ca, Mg, K, Na. A hexagon is drawn with sides 20 mm. in length. Two ions (one electropositive and one electronegative) are arbitrarily assigned to each point of the hexagon in a const. order, viz.: K, NO<sub>3</sub>, Al, S (SH); Na, Cl; Ca, SO<sub>4</sub>; Mg, CO<sub>3</sub> (CO<sub>2</sub>, CO<sub>2</sub>H); Fe, SiO<sub>2</sub>. The radii (of the circle circumscribing the hexagon) which pass through the points of the hexagon are extended and the magnitudes of the contents of the 2 ions in question are represented linearly and simultaneously on the extension of each corresponding radius on a scale where 0.01 g. = 1 mm. The points on the extensions of the radii which are thus detd. by the electronegative ions are connected by straight (red lines) and the points detd. by the electropositive ions are likewise connected (by blue lines), thus producing 2 distorted hexagons enclosing the original hexagon; the distortions of the 2 hexagons are thus graphically characteristic of the saline compn. of the H<sub>2</sub>O. The data (color, odor, dissolved organic matter, nitrites, NH<sub>3</sub>, etc.) of group 2 are regarded as indicating that the H<sub>2</sub>O is (1) pure, (2) suspected or (3) non-potable; these conditions are, respectively, represented by (1) leaving the central hexagon white, (2) ruling this hexagon in one direction, and (3) by ruling it crosswise. In making the above graphical representation the values for Al and Fe are multiplied by 10 on account of their small magnitude. CO<sub>2</sub>H is represented on the extended radius corresponding to CO<sub>3</sub> by measuring outward from the point of the hexagon on the same scale used above, the magnitude of CO<sub>2</sub>H being, however, represented linearly on this radius rather than by the distortion of the hexagon as in the case of CO<sub>3</sub>. CO<sub>2</sub> is represented linearly by a line drawn at an angle from the extremity of the CO<sub>3</sub> radius. The lines representing CO<sub>3</sub>, CO<sub>2</sub>H and CO<sub>2</sub> converge, therefore, at one point, i. e., the extremity of the CO<sub>3</sub> radius. The saline residue at 180° is indicated in the center of the central hexagon and the temp. of the H<sub>2</sub>O is shown below the source of the latter above the hexagon. The electronegative ions of H<sub>2</sub>BO<sub>3</sub>, H<sub>2</sub>PO<sub>4</sub>, HF and H<sub>2</sub>AsO<sub>4</sub> and the ions Mn, Li, etc., are shown, if desired, at the side of their related ions (periodic classification), their relative proportions being indicated by exclamation marks. The above graphic representation gives a practically complete, condensed picture of the data of the usual H<sub>2</sub>O analysis.

H. S. PAINE.

Ilkeston and Heanor water-softening plant and the utilization of refuse lime. ALFRED E. SMITH. *Surveyor* 53, 238-40(1918).—A hard water is softened by the use of CaO. The sludge is dried and sold for use in hardening waters to reduce plumbosolvency; to manufacturers of toilet, face, tooth, and polishing powders, of aerated waters, and to other smaller users.

W. D. C.

The hot mineral springs of Rio Hondo. HÉRCULES CORTI. *Anales soc. quim. Argentina* 6, 215-29(1918).—C. reports the results of physical and chem. examn. of the H<sub>2</sub>O from a no. of hot springs in Rio Hondo (Argentina) in a locality called "Las Termas." Chem. examn. included the following detns.: mineral substance in suspension, reaction (hot and cold) to litmus and phenolphthalein, total and true alkalinity, organic matter, residue at 100-5° and at redness, H<sub>2</sub>SO<sub>4</sub> residue, hardness (total, permanent and temporary), SiO<sub>2</sub>, SO<sub>3</sub>, CO<sub>2</sub>, NaCl, N<sub>2</sub>O<sub>5</sub>, N<sub>2</sub>O<sub>3</sub>, H<sub>2</sub>S, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO, MgO, NH<sub>4</sub>, O and N. Nitrites and NH<sub>3</sub> were only detected in traces if at all. The H<sub>2</sub>O from a no. of the springs contained traces of As, Mn, F, Br, I, P and Ti. Abundant evolution of gas composed of 2 parts N, 1 part O and traces of CO<sub>2</sub> was noted in some of the springs. Samples of H<sub>2</sub>O from a no. of the springs showed varying degrees of radioactivity. The waters of these springs are to be classified as thermal, slightly mineralized and ferruginous (cf. Ducloux's classification of Argentine mineral waters). C. discusses the various characteristics of mineral waters to which therapeutic efficacy may be ascribed and points out the many instances of therapeutic efficiency which still cannot be explained on the basis of these characteristics.

H. S. PAINE.

**Study of the waters of the Atlantic ocean along the Argentina coast.** HÉRCULES CORTI AND HECTOR H. ALVAREZ. *Anales soc. quim. Argentina* 6, 108-20(1918).—C. and A. report analyses of samples of  $H_2O$  of the Atlantic Ocean taken at various points along the Argentina coast, this being the beginning of a systematic oceanographic investigation modeled somewhat after that conducted by the Oceanographic Institute of Monaco. The analyses include the usual detns. of a  $H_2O$  analysis; the examn. of these waters has also been considered from the standpoint of their efficacy in thalassotherapy, samples having been taken at various watering places on the Argentina coast. No general deductions have so far been indicated and reference must be made to the original for data.

H. S. PAINE.

**Temporary and semi-permanent water supplies.** V. P. SMITH. *Professional Papers R. Eng., 4th Series*, No. 10(1918); *Water Water Eng.* 20, 269-71.—A discussion of military practice in construction and operation of camp and field supplies. "Possibly the expert engineer will find little new to him; but for the purpose of military engineers in the field or young engineers in charge of a large staff of workers in an unsettled country, the details supplied cannot fail to be of great assistance." M. C. PERRY.

**Distilled water and its substitutes.** P. CARLES. *Rev. prod. chim.* 21, 314; *Repert. pharm.* 29, 313-5; *Water and Water Eng.* 20, 289.—Owing to coal shortage distd. water is difficult to obtain, and must be replaced in many uses by water decalcified by some other methods. For industrial purposes lime may be eliminated by simple dosage with oxalic acid, proportioned to the degree of hardness as detd. by chemical analysis; where the hardness is unknown, the successive approximation test must be resorted to until the  $H_2O$  is no longer whitened by the acid. C. also warns against the growing use of leaden condenser pipes in the distn. of potable liquids. M. C. PERRY.

**The elimination of spurious presumptive tests for *Bacillus coli* in water by the use of gentian violet.** IVAN C. HALL AND LILLIAN JORDAN ELLEFSON. *Univ. Cal. J. Bact.* 3, 329-54(1918).—An investigation of the inhibitory action of gentian violet on gram-positive bacteria.

JOHN T. MYERS.

**The control of small sewage works.** JAMES H. EDMONDSON. *Surveyor* 54, 183 (1918).—The following tests are recommended: *Oxygen absorbed*: In a stoppered bottle place 100 cc. sample and 10 cc.  $KMnO_4$  soln. (0.4 g.  $KMnO_4$  and 100 cc.  $H_2SO_4$  in 1 liter). Note the time required for the color to disappear. *Nitrates*: Mix 5 cc. effluent and 2.5 cc. 1% brucine soln. in a Nessler tube and pour down the side of the tube 2.5 cc.  $H_2SO_4$ . Note the formation of a pink zone gradually changing to amber. *Turbidity*: Measure depth in a Nessler tube required to obscure black lines ruled on white paper under the tube. *Odor and stability*: Good effluents should have no offensive odor in a stoppered bottle 4-6 days at 80° F. Color from 6 drops of methylene blue soln. should persist 4 days in a stoppered bottle at 80° F.

W. D. C.

**Two sludge problems.** ARTHUR J. MARTIN. *Surveyor* 54, 195-6(1918).—Sewage treated by the activated-sludge process requires from 20 to 70 times the amount of air necessary to furnish the O needed to combine with the organic matter. This excess is required to perform the mixing and because the air passes rapidly through the sewage. M. proposes the use of long horizontal cylindrical tanks, the contents of which are maintained in a state of rapid rotation, combined with a slow longitudinal flow. The rotation may be produced by jets of sewage or air. For removal of a considerable part of the water or sludge it is suggested that the sludge be allowed to settle in tall shafts, where its own weight would consolidate the material and force it out through doors at the base of the shaft. With activated sludge it might be necessary to blow air through the shaft to prevent de-aeration.

W. D. C.

**Sewage treatment at Manchester: Activated-sludge research work.** ANON. *Surveyor* 53, 4-5(1918).—The operation of the works for the fiscal year 1917 was satis-

factory, although reduction of the load on the filtration areas was necessary in order to secure effective operation with the effluents from chemical works. Experimental runs indicated that the activated-sludge treatment is successful in the presence of wastes from manuf. of sulfate of ammonia, products from benzene and aniline, and from a dye works, but more time is required for aeration.

W. D. C.

**Industrial hygiene and occupational diseases.** P. JUQUELIER. *Chimie & ind.* 1, 684-7(1918).—A review of progress in and the change in attitude toward the study of industrial hygiene, with specific advances made in preventing or ameliorating several of the more common and dangerous occupational diseases, and the general principles involved in the campaign.

M. C. PERRY.

**The measurement of atmospheric pollution: Suspended dust and dirt.** J. S. OWENS. *Surveyor* 53, 311(1918).—A brief report of a lecture. During one year, April to March, incl., the deposit of solid material from the air at various places amounted to from 56 to 950 tons per year per square mile.

W. D. C.

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Some applications of ferric sulfate (HUTIN) 18.

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BATISTA COELHO, ARNALDO: *Caldas da Saude—Eficácia das suas aguas.* Santo Tirso. 49 pp. For review see *Rev. chim. pura applicata* [2] 3, 368(1918).

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**Apparatus for "activating" sewage sludge.** L. E. REIN and J. W. COX. U. S. 1,286,775, Dec. 3.

**Apparatus for aerating sewage.** A. M. BROSIUS. U. S. 1,286,520, Dec. 3.

**Disinfectant.** A. A. WELLS. U. S. reissue 14,562, Dec. 10. See original pat. 1,280,602. C. A. 12, 2645.

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## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

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J. J. SKINNER.

**Relationship between the unfree water and the heat of wetting of soils and its significance.** G. J. BOUYOUCOS. Michigan Exp. Sta., *Bull.* 42, 23 pp.(1918).—Thirty-two soil samples, 1 of lampblack, 1 of silica, and 1 of quartz sand were studied by means of a special calorimeter, or thermos jar, which detd. the heat of wetting of the material when treated with  $H_2O$ . The heat of wetting was found to bear a close relationship to the unfree  $H_2O$ , and in particular to that portion of the unfree  $H_2O$  which does not freeze even at  $-78^\circ$  and which has been termed combined  $H_2O$ . It was found that both of these factors tended to vary in the same parallel order in almost all of the soils. In the examn. of 7 soils, quartz sand, kaolin, silica, lampblack,  $Ca_3(PO_4)_2$ ,  $CaO$ , and  $BaSO_4$ , as affected by ligroin alone, ligroin and  $H_2O$ , and  $H_2O$  alone, it was found that with the exception of silica, lampblack, and  $Ca_3(PO_4)_2$  the heat of wetting of the solid materials in ligroin was either entirely absent or very small, while when  $H_2O$  was added to them while still immersed in the ligroin heat was evolved in all of the agr. soils except peat, and in all artificial materials except quartz sand, lampblack, and  $BaSO_4$ , the rapidity and magnitude being almost the same as in  $H_2O$  alone. The article contains full references to previous work leading up to this investigation and gives a full discussion of the theories advanced to explain the results reported.

R. B. DEEMER.

**Soil solution as an index of the biological changes in the soil.** J. F. MORGAN. Michigan Agr. Exp. Sta., *Bull.* 39, 24 pp.(1918).—The van Suchtelen and Itano

method for obtaining the soil soln. was used to obtain solns. which could be studied to observe the effect thereon of various fertilizers. Dried blood, tankage, cottonseed meal,  $\text{NaNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$ , were used and the solns. were tested for sp. gr., sp. cond., f.-p. depression, total solids, reaction, and for N as  $\text{NH}_3$ , as nitrite and as nitrate. It was found that the solns. from the treated soils were more concd. than their respective controls, and the treated soils contain more microorganisms. M. concludes that the soil soln. thus obtained furnishes a suitable means of studying microbial changes in the soil, and since the soil soln. contains the plant ingredients in a form utilizable by the plant it furnishes a better means of detg. in what the soil is deficient. R. B. DEEMER.

**Investigation of peat bogs.** A. ANREP. Canada Dept. of Mines, *Summary Rept.* 1917, 56-8.—This rept. is a statement of the result of surveys of several of the larger bogs of Canada. These bogs cover approx. 7,115 acres. Several of them are recommended as being suitable for the manuf. of peat litter on a commercial scale. The more valuable ones are formed of sphagnum mosses and are practically free from humus. R. L. SIBLEY.

**The partial sterilization of soils and the influence of soil protozoa on their fertility.** GEORGES TRUFFAUT. *Compt. rend. acad. agr. France* 4, 1049-57(1918).—See C. A. 13, 153. ALBERT R. MERZ.

**The partial sterilization of the soil.** *Compt. rend. acad. agr. France* 4, 1030-8 (1918).—A discussion of the preceding paper by members of the Academy.

ALBERT R. MERZ.

**The occurrence of *Azotobacter* in cranberry soils.** SELMAN A. WAKSMAN. *Science* 48, 653-4(1918).—The portion of a Savannah bottom cranberry bog which had been limed gave almost double the crop of the unlimed plot. The unlimed soil had H-ion concn. of  $P_H$  5.4 to 5.6, while for the limed soil  $P_H$  was 6.2-6.4. Cultures from limed soil in N-free mannitol solns. showed *Azotobacter* cells and *Actinomyces* filaments; those from the unlimed soil showed neither. "This will confirm the results of Gainey (C. A. 12, 2221) and Christensen (C. A. 12, 1807) that hydrogen-ion concn. of the soln. =  $P_H$  6.0 is the limiting reaction for the activities of *Azotobacter* in the soil."

ALBERT R. MERZ.

**Theories concerning soils as media for plant growth.** C. B. LIPMAN. Univ. Calif. *School Sci. and Math.* 18, 686-791(1918).—An address in which is given a survey of the important theories in the history of soil studies. J. J. SKINNER.

**Utilization of phosphate deposits of Australia.** J. W. PATERSON. Commonwealth of Australia, Advisory Council of Sci. and Ind., *Bull.* 7, 96-107(1918).—A review of the research bearing upon the utilization of phosphates in plant production and a special plea for a systematic investigation of the value of local deposits to encourage, if advisable, their use in the manuf. of superphosphate. R. B. DEEMER.

**Condition of fertilizer potash residues in Hagerstown silt loam soil.** WILLIAM FREAR AND E. S. ERB. Penn. Agr. Expt. Sta. *J. Agr. Research* 15, 59-83(1918).—Comparative studies were made of two plats of Hagerstown silty loam, of which one had received 18 biennial dressings of 200 lbs. of KCl, while the other had received no KCl. Analyses were made of total  $\text{K}_2\text{O}$ , and  $\text{K}_2\text{O}$  sol. in HCl (d. 1.115), 0.2 N HCl, distd.  $\text{H}_2\text{O}$ ,  $\text{CO}_2$  soln., and N/3  $\text{NH}_4\text{Cl}$ . The total  $\text{K}_2\text{O}$  of the two soils was about the same, that of the untreated being slightly higher, 3.821% to 3.543% in the treated soil, while percentages of the total  $\text{K}_2\text{O}$  dissolved by the various solvents were as follows, the first number being for the untreated plot: strong HCl 9.65, 11.49; 0.2 N HCl 0.374, 0.850; distd.  $\text{H}_2\text{O}$ , 0.084-0.118, 0.138-0.226;  $\text{CO}_2$  soln., 0.199, 0.395; and N/3  $\text{NH}_4\text{Cl}$ , 0.246, 0.528. A second extn. with N/3  $\text{NH}_4\text{Cl}$  gave 0.052, 0.059. Samples of each soil were sepd. into clay and non-clay portions and each was treated with

$N/3$   $NH_4Cl$ ; the percentages of total  $K_2O$  removed from each were: Clay 0.761, non-clay 0.102, 0.32. Analyses from previous work upon the same plots by other investigators, showing the  $K_2O$  content of oats, corn, wheat and hay grown upon these or similar plots, are included, and show that in every case more  $K_2O$  is removed from the treated soil, the increase over the amt. removed from the corresponding untreated soil ranging from 15% in the case of corn to 75% in the case of hay. The total  $K_2O$  removed by these crops, however, would account for only one-fourth of the total amt. applied, leaving a residue of 1300 lbs. per acre applied during the 36-yr. period yet unaccounted for. The soils are naturally rich in  $K_2O$  and the yield of the above mentioned crops was no greater upon the treated than upon the untreated plots. On the basis of the quantities removed annually by the plants, the amt. dissolved by distd.  $H_2O$  is sufficient to last the plants 4 yrs., while the corresponding numbers for the other solvents are: carbonated  $H_2O$ , 7 yrs.;  $NH_4Cl$ , 9 yrs.; and 0.20  $N$   $HCl$ , 13 yrs.

R. N. HARGER.

**Effect of hydrocyanic acid gas under vacuum conditions on subterranean larvae.** E. R. SASSER AND H. L. SANFORD. Federal Horticultural Board. *J. Agr. Research* 15, 133-37(1918).—To test the efficiency of fumigation with  $HCN$  upon plants the roots of which have been balled in wet earth, 3 species of subterranean larvae were buried from 1 to 3 inches deep in dry, moist and soaked earth and the soil was fumigated with  $HCN$  under varying conditions of pressure and time. The fumigation chamber was first partly evacuated and the  $HCN$  then allowed to enter. Very good results were obtained with the dry and moist soils using 0.5-1.5 ounces of  $HCN$  per 100 cu. ft. with an initial vacuum of 27 in. for 15 min. and then atm. pressure for 1.5 hrs., but with the soaked soil even 3 oz. of  $HCN$  per 100 cu. ft. under pressures ranging from 26 in. vacuum to 10 lbs. pressures failed to kill 100%.

H. N. HARGER.

**Treatment of crude ammonias (HUTIN) 18.** Calcium nitrate (U. S. pat. 1,286,839) 18.

PETERS, CHARLES A.: **The Preparation of Substances Important in Agriculture. A Laboratory Manual of Synthetic Agricultural Chemistry.** 3rd Ed. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 81 pp. 80 c net post-paid.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

**Chinese wines.** Y. P. SUN. *Far Eastern Rev.* 14, 365-6(1918).—S. reports upon the use and manuf. of spirits by the Chinese, indicating 3 general types. Two of these are fermented liquors containing about 10% alc., the other is a distd. liquor averaging 45% in alc. content. All are mistakenly termed "wines." The author describes crude forms of distg. app. still in use. Rice and "kao-liang" are the grains commonly used.

WM. H. ADOLPH.

**The food-stuff content of various brewery yeasts as well as of the new so-called mineral yeast.** D. MEYER. *Landw. Wochenschrift für die Provinz Sachsen* 1916, No. 45; *Z. angew. Chem.* 1917, No. 90, p. 355; *Biedermanns Zentr.* 47, 189-90(1918).—The av. crude protein content of brewery yeast is 52.74%. Calcd. on the basis of the same ash content that of the mineral yeast is 50.9%. Brewery yeast contains 38.55% pure protein; mineral yeast, 37.21%. The low content of pure protein in the mineral yeast is attributed to the low crude protein content and in the brewery yeast to the

extraordinarily high amide content. There is but slight difference in the N-free exts. (including fat and crude fiber), these being 27.91% for the brewery yeast and 25.14% for the mineral yeast. The ash of the mineral yeast contains mainly calcium phosphate; that of the brewery yeast, alkalies. Brewery yeast has an av. ash content of 7.86%, mineral yeast 18.28%.

ALBERT R. MERZ.

The nutritional physiology of alcohol and acids in yeasts and other widely distributed fungi. TH. BOKORNY. *Allgemeine Brauer-und Hopfenzeitung* 1917, No. 57, p. 747; *Z. angew. Chem.* 1917, No. 90, p. 355; *Biedermanns Zentr.* 47, 191(1918).—The alcohols and org. acids observed in fermentation are grouped together. Two tables show which of these fermentation products can serve as food for fungi and green plants. The injurious effects of the acids and of some bases are discussed. All acids hinder fermentation at a certain concn. which is high even for mineral acids. Formic and oxalic acids are the most harmful. Bases hinder fermentation more effectively than acids.

ALBERT R. MERZ.

Reducing the alcohol content of beer. H. HÄUSER. U. S. 1,286,315, Dec. 3. In reducing the alc. content of beer, a charge of beer is caused to flow in a thin film on the inner surface of a vacuum pan and the opposite side of the wall of the pan is heated by steam under pressure to boil off alc. The area of the wall to which steam is applied may be varied to regulate the process as desired.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

The determination of morphine in complex products. I. A revision of the analytical reactions employed. ALFRED TINGLE. *Am. J. Pharm.* 90, 689-706(1918).—All the data which might have a bearing on the analytical behavior of morphine have been studied, carefully revized and results are briefly set forth. A method has been devised, founded on these data, by which morphine in medicinal prepn. can be accurately detd. II. Mixtures containing morphine as a simple salt. *Ibid* 788-95.—A method is given for the detn. of morphine, not only in simple powders and tablets but in pills of complex compn.: Weigh a sample of 6 g. and transfer it to a 100-cc. graduated flask. Add approx. 2 g. of pure  $\text{CaCO}_3$  and mix by gently shaking, then add 20 cc. of water and warm on the water bath till a uniform, thin paste has been formed. While the warming is in progress the flask should be loosely closed by a rubber stopper. Cool the mixt., then add 60 cc. of a cold satd. soln. of  $\text{Ba(OH)}_2$ . Mix the contents of the flask thoroughly and allow to stand for 20 to 30 min. Dil. with water to 100 cc., mix well, and pour on a dry 15-cm. filter paper. Transfer the residue on the filter to a beaker, add a slight excess of  $\text{HCl}$ , warm almost to boiling, and filter. Collect as much as possible of this filtrate and conc. to about 15 cc. Test this with  $\text{FeCl}_3$  for meconic acid. Its presence indicates that any morphine in the pills being examd. is in the form of opium, in which case the method described in Part III (below) must be employed. If no meconic acid is found, transfer 50 cc. of the filtrate to a flask graduated to contain 55 cc. such as is commonly used in the analysis of sirups and sugars. Add  $\text{H}_2\text{SO}_4$  (1:5) very cautiously, till all Ba has been pptd. and the soln. is just acid to litmus. Dil. the contents of the flask to the 55-cc. mark and mix thoroughly. Allow the ppt. to settle; filter through a dry 7-cm. paper. Transfer 50 cc. of the filtrate to an evapg. dish, and add  $\text{NaOH}$  soln., drop by drop, till the stirred liquid is just alkaline to litmus paper. Add  $\text{HCl}$  with equal care till the soln. is acid once more, then evap. as rapidly as possible on the water bath till the vol. of liquid remaining does not exceed 5 cc. Do not evap. to dryness. Transfer the contents of the dish to a small sepg. funnel,

washing the dish very clean with alc. and water, used alternately, and wiping it thoroughly with a rubber-tipped glass rod. The total vol. of washings should not exceed 15 cc., of which not more than 5 cc. should be alc. Add 25 cc. of  $\text{CHCl}_3$ -alc. mixt. (2 vols. of  $\text{CHCl}_3$ :1 vol. of alc.) to the contents of the sepg. funnel, followed by a cold satd. soln. of  $\text{NaHCO}_3$ . This latter should be added almost drop by drop, till complete alkalinity is ensured, but an undue excess must be avoided. An excess tends to encourage emulsification and also unduly to dil. the aq. layer to be extd. Shake the sepg. funnel well and steadily for not less than 3 min., then allow to stand. Sepn. into layers is generally very rapid. Run the lower layer into a flask and repeat this extn. and sepn., using the same vol. of solvent and shaking for the same period. Four such extns. should always be made, but if there is any tendency to the formation of an emulsion a 5th extn. is desirable as a safeguard. The combined exts. are distd., the flask being heated on a water bath almost to dryness. Dissolve the residue in an appropriate measured quantity of 0.1  $N$   $\text{H}_2\text{SO}_4$  or a standard acid of approx. that strength (1 cc. acid = 0.0300 g. morphine is very convenient), and titrate back with 0.1  $N$  or 0.05  $N$   $\text{NaOH}$  soln. Lacmoid or cochineal is a very suitable indicator. III. **Opium and mixtures containing opium.** *Ibid* 851-61.—T. recommends the following method which can be applied equally well to dry or moist opium, to opium ash (so often a constituent of Chinese pills for the "cure" of the opium habit) or to complex pills containing these substances: Place 6 g. of the sample in a flask graduated to contain 100 cc. and digest for 10 min. on the water bath with 2 g. (approx.) of  $\text{CaCO}_3$  and enough water to form a thin paste. While warm, close the flask lightly with a rubber stopper. After digestion, cool the flask and add 60 cc. of a cold satd. soln. of  $\text{Ba}(\text{OH})_2$ . Shake the flask, now closely stoppered, at intervals. After 20 to 30 min. add water to bring the total vol. to 100 cc. Filter the soln. through a dry 15 cm. paper, and transfer an aliquot portion of the filtrate (50 cc.) to a flask graduated to contain 55 cc. (meantime the residue on the filter may be examd. for meconates as described in Part II). Add  $\text{H}_2\text{SO}_4$  (1:5) by drops till the soln. is faintly acid and no more ppt. forms, warming the flask on the water bath to promote settlement. Make the soln. faintly alk. by the cautious addition of concd.  $\text{NaOH}$ . Next, add salicylic acid, in crystals, till acidity is restored, warming the flask after each addition to induce rapid soln. of the acid. When an acid reaction has developed, add the further quantity of 0.5 g. of salicylic acid and heat the flask for 10 min. by immersion in boiling water. Allow to cool to normal temp. and add enough water to bring the contents to 55 cc. Filter the liquid through a dry 7-cm. paper, and take an aliquot portion of the filtrate (preferably 50 cc.) for further operations. Evap. the clear soln. on the water bath (best in a platinum dish) almost to dryness. Cool the dish and add enough water to make the vol. of its contents as nearly as possible 5 cc. To this add 5 cc. of  $\text{CHCl}_3$  and about 3 drops of concd.  $\text{NH}_4\text{OH}$  soln. or as much more as is needed to produce decided alkalinity. Mix the liquids well with a stirring rod by scratching the bottom of the dish lightly, thus breaking up undissolved aggregates, and promoting rapid pptn. of the morphine. When the latter substance begins to sep. cover the dish and set aside for 4 hrs., during which time it should be occasionally agitated with a rotary motion. Filter the contents of the dish through a cotton plug with the aid of suction. Wash the dish and morphine with small quantities of cold water (morphinated water may be substituted at the analyst's discretion) till the washings become colorless. About 10 cc. of water, if care is used, should suffice for this washing, in most cases. The morphine thus obtained is yellowish and not pure enough to give reliable results on titration. The plug with adherent alkaloid is lifted into a small sepg. funnel. Dissolve the morphine remaining in the dish in a small quantity of dil.  $\text{H}_2\text{SO}_4$  and transfer the soln. to the sepg. funnel through the funnel previously used for the filtration. Wash the dish and funnel with water.

Washings and acid together should not exceed 20 cc. Make the soln. of morphine sufficiently alk. to liberate all the alkaloid by the addition of either a few drops of concd.  $\text{NH}_4\text{OH}$  or a satd. soln. of  $\text{NaHCO}_3$ . Shake for 3 min. with 25-30 cc. of  $\text{CHCl}_3$ -alc. mixt. (2 vol. of  $\text{CHCl}_3$  to 1 vol. of alc.). After sepg. the lower layer of liquid, repeat the extn. on the aq. layer with 3 further similar quantities of the  $\text{CHCl}_3$ -alc. mixt., the time of shaking being 3 min. in every case. Dist. the combined exts. on the water bath. Dissolve the residue of almost white morphine in a known vol. of 0.1  $N$   $\text{H}_2\text{SO}_4$  and titrate the excess with 0.1  $N$  or 0.05  $N$   $\text{NaOH}$ . Lacmoid, cochineal or methyl orange is a suitable indicator. The wt. of morphine found by this titration will be  $\frac{10}{13}$  of that present in the original 6 g. sample, if the aliquot parts taken were those recommended above.

W. G. GAESSLER.

**Normal salt solution.** LOUIS GERSHENFELD. *Am. J. Pharm.* 90, 782-8(1918).—Results of expts. show that heating in the steam sterilizer is the best sterilization method to be employed by the average physician and practitioner so as to avoid concn. of the soln. The autoclave is to be preferred as it is undoubtedly a more effective method of rendering material sterile, while an average concn. to 0.871% of  $\text{NaCl}$  will not bear any marked relationship to the isotonicity (0.85%) of the end product. Mere boiling is not to be recommended, unless the water of evapn. be replaced by freshly distd. sterile water. Another series of expts. to ascertain what effect salt solns. of different strengths will have on the red blood cells, showed that hypoisotonic saline solns. increase the size of the red blood cells and pharmaceutically speaking may be said to have a solvent effect on these corpuscles, while hyperisotonic solns. produce a most marked toxic effect and create the erythrocytes (either by dehydrating or due to its high osmotic pressure).

W. G. GAESSLER.

**Surgeon's liquid adhesive.** E. FULLERTON COOK. *Am. J. Pharm.* 90, 808-9 (1918).—C. suggests the use of a water-sol., liquid adhesive for fastening bandages and recommends the following inexpensive and practical formula: 1000 g. liquid glue (a commercial glue, such as Dennison's, is readily obtained in bulk), 200 g.  $\text{ZnO}$ , 15 cc. oil of peppermint; mix and rub to a smooth paste.

W. G. GAESSLER.

**The percentage of stems in belladonna herb and its effect on the quality of the herb.** ARTHUR F. SIEVERS. *Am. J. Pharm.* 90, 838-51(1918).—Sprouts of belladonna were cut at 8 different stages of growth. Tabulated results (Table I) show that in the smaller sprouts cut, the 1st stage, the stems represent 18% of the total dry wt. As growth continued, this % gradually increased until it reached 41.58% at the 8th stage. Although the first material was picked when the stems were only 9 to 14 cm. long, the % which these represent by the total dry wt. is 8% more than allowed by the U. S. P., namely, 10%. The % of alc. ext. which can be obtained from the material decreases steadily from the 1st to the 8th stage. The stems show the greatest range in the amt. of ext. yielded, the highest being 44% at the 1st stage and the lowest 18.1% at the 8th stage. The leaves show a decrease of only about 10% from the first to the 8th stage. While the decrease in % of alc. ext. is general it is evident from the tables that 25% of stems may be included in the herb without reducing the % of ext. more than 6%. The % of total alkaloids also decreases through the different stages. This is decidedly marked in the stems, 0.898% being present at the first stage and 0.170% at the last stage. In the leaves the % decreases gradually and reaches the minimum of 0.537% at the 7th stage. The whole herb decreased in total alkaloids from 0.756 to 0.471% and at no stage was the % as low as the minimum 0.3% set by the pharmacopeial standard. Expts. to det. how the quality of the leaf is affected by the successive admixture of stems of certain diameter show that a mixt. of "a fair quality of herb such as is readily produced in this country containing about 20% of stems up to 7 or 8 mm. in diameter when green," contains about 10% of ash, about 23% of alc. exts., and about



0.5% of total alkaloids. S. concludes that a mix. of approx. this compn. should be a very suitable product for practically all purposes for which belladonna is marketed and suggests increasing the % of stems allowed to 20% provided it is not made possible thereby to increase the foreign matter to a similar extent. W. G. GAESSLER.

**Essential oil of *Pinus thumbergii*, Parl.** Y. SHINOZAKI. *Kōgyō-Kwagaku Zasshi* (J. Chem. Ind.) 21, 763-74(1918).—The crude oil obtained from the pine tree grown in Akita, Japan, contains 22.92% essential oil, 73.36% colophonium, 3.61% H<sub>2</sub>O and 0.21% impurities. The essential oil b. 154-252° and shows the following physical properties:  $d_{15}$  0.840,  $n_D^{20}$  1.4738,  $[\alpha]_D$  -19.17°, acid value 0.53. By fractional distn. of the purified oil *in vacuo*,  $\alpha$ -pinene (73%), camphene and a tricyclic sesquiterpene (16.6%) were isolated. The latter b. 105-6°,  $d_{20}$  0.9342,  $n_D^{20}$  1.9055,  $[\alpha]_D$  +43.5°, gave no solid compds. with HCl and HNO<sub>3</sub>. S. KOMATSU.

**Essential oil of *Amorpha fruticosa*.** Y. SHINOZAKI AND K. HOSHINO. *Kōgyō-Kwagaku Zasshi* (J. Chem. Ind.) 21, 774-81(1918); cf. Nakatogawa, C. A. 13, 384.—By steam distn. of dry fruit of *Amorpha fruticosa* grown in Manchuria, China, was obtained in 11% yield a pale yellow oil,  $d_{15}$  0.9126,  $n_D^{20}$  1.5032, sapon. value 40.51. The oil consists of a fraction b. 115-120° 48% and a fraction b. 120-125° 23%, from which codinane and another sesquiterpene, C<sub>15</sub>H<sub>24</sub>, were isolated. A sesquiterpene alc. m. 118-119° was obtained from the fraction b. 125-38°. S. KOMATSU.

**The constituents of Korean ginseng.** II. H. KONDO AND S. YAMAGUCHI. *Yakugaku-Zasshi* (J. pharm. Soc., Japan.) No. 440, 747-64(1918).—By passing steam into the ether ext. of the ginseng, a volatile oil and non-volatile substance were obtained. The latter was decompd. by alc. KOH into phytosterol m. 133-4° and fatty acids. The fatty acids sepd. from the alk. soln. on acidifying with HCl, were purified by distn. *in vacuo*, b. 220°. Solid satd. and liquid unsatd. acids were sepd. by transforming into their Pb salts. The solid part, m. 56-7°, mol. wt. 267.7, was found to consist of 44.3% stearic and 55.7% palmitic acids by Hausmann and Zulkowsky's formula. In the liquid part, linoleic acid was isolated and also confirmed by its tetrabromo compd., m. 113-4°. From 18 kg. ginseng cultivated in Aidzu, Japan, 10 g. colorless volatile oil of the compn. (C<sub>6</sub>H<sub>8</sub>)<sub>x</sub> was obtained, which shows the following properties: b. 140-143°; b. 247°,  $d_{15}$  0.9194,  $[\alpha]_D$  -5.41,  $n_D^{20}$  1.49455. In the AcOH soln., it gives with concd. H<sub>2</sub>SO<sub>4</sub> greenish brown color changing to deep green. According to the authors' expts. the ether exts. of ginseng grown in Korea and in Aidzu, Japan, contain the same constituent. S. KOMATSU.

**Hydrocyanic acid in the fern, *Gystopteris alpina* Desv.** MARCEL MIRANDE. *Compt. rend.* 167, 695-6(1918); cf. Greshoff, C. A. 3, 1764.—HCN is contained in the green parts of this fern. Under the influence of an enzyme, which acts like emulsin, the compd. containing the HCN is decompd. and upon distn. of the macerated leaves HCN and C<sub>6</sub>H<sub>5</sub>CHO are obtained, the quantity of the acid being 0.01107 g. in 100 g. of fresh leaves. When drying, the plant exhales the odor of bitter almonds.

L. W. RIGGS.

**Citronellol.** H. J. PRINS. Zaandam. *Chem. Weekblad* 15, 1378-80(1918).—Attempts to sep. citronellol (made by reduction of natural citronellal) into its isomers by fractional distn. yielded mixts. The completeness of the sepn. was checked by careful sp. gr. detns. There were 3 principal fractions which could not be further sepd. by fractionation. Their b. p. ranges and av. sp. gr. were as follows: 215-7° (0.8742); 217-9° (0.8670); 220-2° (0.8694). The variations in both properties were sufficient to indicate that neither of the fractions was homogeneous. The following constants may be assumed for the purest citronellol obtainable by this means:  $d_{15}$  = 0.867-69;  $n_D^{20}$  = 1.4586-89. It is free from geraniol. JULIAN F. SMITH.

**Zinc chloride.** T. C. N. BROEKSMIT. Haarlem. *Pharm. Weekblad* 55, 1409-10 (1918).—The  $ZnCl_2$  used in irrigating liquid is always contaminated with a basic chloride if prepd. by neutralizing  $ZnO$ ,  $Zn(OH)_2$  or  $2ZnCO_3 \cdot 3Zn(OH)_2$  with  $HCl$ . It forms a ppt. which can be removed by filtration or adding  $CaCO_3$  or  $MgCO_3$ , but either treatment decreases the concn. of  $ZnCl_2$  below the required minimum. The soln. is best prepd. by mixing thoroughly 21.1 g. of  $ZnSO_4$  and 17.9 g. of  $BaCl_2$  (both finely powdered), and adding 100 cc. of  $H_2O$ . If carefully filtered, this yields approx. an 8% soln. of  $ZnCl_2$ , free from basic salt, and giving a clear soln. in  $H_2O$ . JULIAN F. SMITH.

**The acid reaction of the juice of *Rubi idaei*.** T. C. N. BROEKSMIT. Haarlem. *Pharm. Weekblad* 55, 1410-2 (1918).—The juice of *Rubi idaei* contains  $HOAc$  and citric acid, but no tartaric nor malic acid. JULIAN F. SMITH.

**Thyroid glands.** D. VAN OS. Amsterdam. *Pharm. Weekblad* 55, 1426-31 (1918).—Unlike most pharmaceuticals, thyroid preps. are not standardized according to any adequate system. The usual plan of stating strength in germs of the wt. of the fresh glands and gaging the dose accordingly, is very unreliable because of wide variations in the amt. of fat and  $H_2O$  in the fresh glands. This is especially true of the glands from sheep. The I content of the dried, fat-free powder is fairly const. in preps. from sheep (ranging in 5 samples from 0.355 to 0.38%), but less so in those from swine (ranging in 7 samples from 0.15 to 0.266%). The Holland Pharmacopeia requirement of 0.4% should be lowered to not more than 0.3%. Expts. failed to show that I takes any part in the action of thyroid prepn. Since neither a chem. nor a physiological method of standardization is practicable, the most reliable basis for expressing the strength and calcg. the dose is the wt. of the dried, fat-free powder. J. F. S.

**The phenol occurring in the leaves of *Coleus amboinicus* Lour (*C. carnosus* Hassk).** F. WEZHUZEN. *Pharm. Weekblad* 55, 1470-2 (1918).—*Coleus amboinicus* bears a considerable reputation in the Orient as a medicinal herb. Analysis of the essential oil obtained from the leaves showed that about half the oil consists of carvacrol. The plant therefore possesses medicinal value. JULIAN F. SMITH.

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Identification of the cinchona alkaloids (WHERRY, YANOVSKY) 10.

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KANTHACK, R.: **Tables of Refractive Indices. Vol. I. Essential Oils.** Edited by J. N. Goldsmith. London: A. Hilger, Ltd. 148 pp. 15s.

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**Trimethyleneglycol disalicylate.** A. M. CLOVER. U. S. 1,286,944, Dec. 10. Trimethyleneglycol disalicylate,  $CH_2(CH_2O_2CC_6H_4OH)_2$ , softens  $74-5^\circ$ , m.  $77^\circ$ , colorless, odorless, nearly tasteless, insol. in  $H_2O$ , readily sol. in  $CHCl_3$ ,  $C_6H_6$ , acetone and ether and sparingly sol. in alc. and petroleum ether, is made by heating trimethyleneglycol with  $H_2SO_4$ , adding salicylic acid and heating the mixt. to  $100^\circ$ . It may be used as a remedy for rheumatism.

**Synthetic drugs.** J. TCHERNIAC. Brit. 120,081, Oct. 23, 1917. Hydroxyallylethers of *p*-acetaminophenol and its substitution products are prepd. by the reaction of alkylene halohydrins or hydroxyalkylene halohydrins in  $H_2O$  on *p*-acetaminophenol or its substitution products, in the presence of a substance fixing halogen hydride. According to an example, the  $\beta$ -hydroxyethylether of *p*-acetaminophenol is prepd. by heating ethylene chlorohydrin with a soln. of *p*-acetaminophenol in aq.  $NaOH$ .

**4-Diallylamino-1-phenyl-2,3-dimethyl-5-pyrazolone.** Soc. ANON. POUR L'IND. CHIM. A. BALE. Ger. 204,983, 1918. 4-Diallylamino-1-phenyl-2,3-dimethyl-5-pyrazolone, colorless crystals, m.  $90^\circ$ , possessing antipyretic and narcotic effect, is obtainable by the action of allyl halides on 4-amino-1-phenyl-2,3-dimethyl-5-pyrazolone in the

heat, preferably in the presence of a solvent or diluent, and with the addition of some substance to remove the acid produced.

**Salt of fructosediphosphoric acid.** BAYER & Co. Ger., 302,094, 1918. The Ca salt of fructosediphosphoric acid (from metaphosphoric esters and fructose) is only sparingly sol., but is, nevertheless, easily absorbed in the organs, and is claimed to be good in such cases as rickets.

**Amylene bromohydrin (bromoamyl alcohol).** EMIL RATH. Ger. 301,905, 1918. Mixts. of hypobromites and such acids as  $H_2BO_3$  yield with amylene ( $\beta$ -Me- $\Delta^2$ -butylene) in the cold the bromohydrin, which may be useful in the production of pharmaceutical preps.

**1,8-Dihydroxyanthranol.** BAYER & Co. Ger., 296,091, 1917. 1,8-Dihydroxyanthranol, m.  $178-80^\circ$ , a valuable agent in cases of psoriasis and other skin diseases, is prepd. by the reduction of 1,8-dihydroxyanthraquinone by means of Zn and an acid.

**Derivatives of homatropine.** CHEM. WERKE, GRENZACH. Ger. 299,806, 1917. The pharmacologically inactive homatropine can be rendered active by esterification with organic acids such as benzoic, tropic, or mandelic acid, the resulting esters (cf. *Ber.* 1918, 51, 235-52) resembling atropine in their effect on the animal organism. In this way, anhydroecgonine, hitherto valueless, can be converted into therapeutically useful products.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**Science in relation to the industries of the Swansea district.** C. JOHNS. *Engineering* 106, 542, 622-3(1918).—A lecture. F. W. SMITHER.

**How to promote our (Japanese) chemical industry.** K. KONDO. *J. Chem. Ind. Japan* 21, 783-94(1918).—A lecture. S. KOMATSU.

**The fixation of nitrogen as cyanide.** Y. MORIMOTO. *Kogyo-Kwogaku-Zasshi (J. Chem. Ind.)* 21, 881-98(1918).—This is a study of Bücher's method (*C. A.* 11, 1020). The materials used were Fe turning, charcoal (3.16% to ash) and  $Na_2CO_3$  (*Jap. Pharm.*). They were briquetted in the proportions 2:2:1 or 2:2:1.35. N obtained from  $NH_4NO_3$  was passed over the briquets placed in a horizontal tube furnace heated to  $820-950^\circ$ . NaCN can easily be obtained in a yield of 75%. S. K.

**Effect of phosphine and hydrogen sulfide on the oxidation of ammonia to nitric acid.** GUY B. TAYLOR AND JULIAN H. CAPPS. *J. Ind. Eng. Chem.* 11, 27-8(1919).— $PH_3$  has a marked deleterious effect, somewhat cumulative, on oxidation of ammonia to nitric acid by catalytic platinum. Small concns. of  $H_2S$  have no immediate toxic effect.

E. M. BILLINGS.

**Treatment of crude ammonias.** A. HUTIN. *Rev. chim. ind.* 27, 147-50(1918).—A brief outline, with discussion, of processes in use for removing free S,  $(NH_4)_2SO_4$ ,  $NH_4CNS$ , and alkali ferrocyanides. The official methods (French) for the analysis of S for agricultural purposes are also given (detn. of fineness, moisture, ash, free S, insol. in  $CS_2$ ). A table is appended showing analyses of crude ammonia by Sorel and by the author, the free S content varying from 5.4 to 50.2% in the 5 lots reported. The author emphasizes the economic possibilities in the recovery and utilization of the S (by the  $Ca(OH)_2$  process). F. W. SMITHER.

**The recrystallization of niter cake.** BLAIR SAXTON. *J. Ind. Eng. Chem.* 10, 897-901(1918).—Equations have been developed for the system  $Na_2SO_4-H_2SO_4-H_2O$  at  $25^\circ$  by means of which can be calcd. (a) how much of any one solid phase will sep.

from a soln. if the compn. of the original solute and the acid concn. of the soln. after crystn. are known; and (b) the wt. of  $H_2O$  in the soln. after crystn. or the wt. of  $H_2O$  to be added to the solid niter cake in order to leave a calcd. wt. of one of the solid phases. Calcns. are also made of the max. amt. of each solid phase which can be removed from soln. at  $25^\circ$  and  $0^\circ$ . Processes are suggested whereby the  $H_2SO_4$  may be concd. in the soln. and  $Na_2SO_4$  in the solid at the 2 temps. mentioned. The sepn. can be made much more efficiently at the lower temp.

A. L. FIELD.

**Sodium sulfide and other products from niter cake.** H. P. BASSETT. *Chem. Met. Eng.* 19, 790(1918).—A discussion of some of the methods that have been proposed for the utilization of niter cake, *e. g.*, the production of  $Na_2SO_4$  by neutralizing with  $CaO$ ; the manuf. of  $HCl$ ,  $HNO_3$ , and  $H_2SO_4$ , etc. The author considers the production of  $Na_2S$  as the best soln. of the problem, and suggests that the partial oxidation taking place in Berthier's method be obviated by using C in the form of bituminous coal. The volatile matter given off keeps the furnace (of a special, air-tight design) full of reducing atm. This reaction does not require a high temp., 96% conversion being obtained at  $650^\circ$  in a cast or wrought Fe tube furnace. Means must be provided for cooling the material as discharged from the furnace out of contact with the air. As the added C is in excess of that required for the reduction, the cinder will contain some free C and will require leaching and crystallizing to recover the  $Na_2S$  in marketable form.

F. W. SMITHER.

**Some applications of ferric sulfate.** A. HUTIN. *Rev. prod. chim.* 21, 313-4 (1918).—For the prepn. of technical  $Fe_2(SO_4)_3$ , the author recommends: (1) treating pyrites cinder with warm  $40^\circ$  to  $45^\circ$  B $\acute{e}$ .  $H_2SO_4$ ; (2) fusing the cinder with  $NaHSO_4$  residue (yields a mixt. of  $Fe_2(SO_4)_3$  and  $Na_2SO_4$ ). This material is used for coagulating blood and preventing nauseous odors in abattoirs, etc., and for water purification. The economic prepn. of  $FeSO_4$  may be effected by: (1) treating  $Fe_2(SO_4)_3$  with scrap Fe; or, treating the mixt. of  $Na_2SO_4$  and  $Fe_2(SO_4)_3$  with scrap Fe, finally obtaining by crystn. a double sulfate of Fe and Na; (2) the action of  $Fe_2(SO_4)_3$  on crude pyrites ( $Fe_2(SO_4)_3 + FeS_2 + O_2 = 3FeSO_4 + 2SO_2$ ; or,  $Fe_2(SO_4)_3 + FeS_2 + 4H_2O = 3FeSO_4 + 2SO_2 + H_2$ ). The odor of  $SO_2$  is always noted, that of  $H_2S$  at times. The  $Fe_2(SO_4)_3$  used is obtained from pyrites cinder.

F. W. SMITHER.

**Seaweed as a source of iodine.** W. DOHERTY. *Chem. Eng. Mining Rev.* (Australia) 11, 53(1918).—The large brown variety of the *Laminaria*, identified as *Ecklonia radiata*, obtained in the vicinity of Sydney Heads, N. S. W., contained I in the following amts.: fresh weed 0.06, dry weed 0.40, ash 1.5%. The fresh weed yielded 4% of ash containing, besides I and Br, about 18%  $K_2O$ . Dry seaweed from other sources (coasts of Scotland, Ireland, Spain, and France) contain I as follows: *Laminaria digitata* 0.45%, *L. stenophylla* 0.48%, *L. saccharina* 0.28%, Japanese edible seaweed 0.31%. The following analysis is reported of the ash of kelp (ash produced in Scotland):  $K_2SO_4$  12.71,  $KCl$  18.09,  $NaCl$  6.8,  $Na_2CO_3$  3.5,  $Na_2S_2O_3$  0.2,  $NaI$  1.5, total  $K_2O$  18.32%.

F. W. SMITHER.

**The Canadian graphite industry.** H. S. SPENCE. Canada Dept. Mines, *Summary Rept.* 1917, 49-50.—Two deposits of graphitic shales which carry a very finely divided amorphous graphite of 25% C content are described. The flake graphite occurs in disseminated form either in cryst. limestone or in more or less calcareous bonds intercalated in gneiss. At present only 3 mines are being operated steadily while 9 mines are operated intermittently.

R. L. SIBLEY.

**The recovery of volatile solvents by simple condensation.** PONCHON. *Chimie & industrie* 1, 481-91(1918).—A review and discussion, with examples, drawings, tables, and curves, from the physico-chem. viewpoint.

F. W. SMITHER.

**Exhaust steam at high back pressures.** CROSBY FIELD. *Chem. Met. Eng.* 20, 18-24(1919).—The author gives a system of charts plotted from thermodynamical formulas, data and plant tests for use in solving heat problems with exhaust steam graphically. In illustration an 8-ton dye plant problem is given requiring a wide range of temps. in general chem. equipment, *e. g.*, steam-jacketed evapg. pans, vacuum driers, kettles and hot chambers. F. W. SMITHER.

**Patent legislation.** ANON. *Engineering* 106, 650-1(1918).—A review and discussion of a critical report of the Inst. of Elec. Engineers (also adopted by about 30 of the leading scientific and technical societies) on a bill (now abandoned) introduced into parliament about a year ago to amend the Patents and Designs Act of 1907. The contemplated legislation is to be revived and a new bill introduced. F. W. S.

**The fruits of the moriche palm** (ANON) 12. **The nature of the recombined potash in cement-mill dust** (MERZ, ROSS) 20.

**Engineering Directory.** A Comprehensive Directory of Manufacturers of Mill, Steam, Mine, Plumbing, Heating and Lighting Supplies, Machinery and Tools. Chicago: The Crawford Publishing Co. 566 pp. For review see *J. Am. Soc. Mech. Eng.* 41, 84.

GRANDMOUGIN, EUGÈNE AND GRANDMOUGIN, PAUL: *La Réorganisation de l'industrie chimique en France.* Paris: H. Dunod et E. Pinat, 47-49 Quai des Grands-Augustins. 277 pp. 12 fr. 50.

NEFF, PETER. *Bibliography of American Literature Relating to Refrigeration, with Synopsis of Papers and Reports Covering the Year 1915.* Compiled under the direction of the Committee on Papers and Lectures of the American Association of Refrigeration. Chicago: Published by the Association of Refrigeration. 107 pp. For review see *J. Frank. Inst.* 187, 125.

WITHEY, M. O. AND ASTON, JAMES: *The Materials of Construction. A Modification and Revision of the Earlier Treatise of the late Dean. J. B. JOHNSON.* 5th Ed. Edited by F. E. Turneure. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 840 pp. \$6.00.

**Ammonia.** NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit. 120,034, July 13, 1918. In the manuf. of  $\text{NH}_3$  by hydrolysis of cyanamide, the  $\text{H}_2\text{O}$  used has a temp. of at least  $40^\circ$ . Considerably less  $\text{Na}_2\text{CO}_3$  is then necessary to effect the hydrolysis.

**Mono-, di- and tri-metallic alkali perphosphates and perarsenates.** S. ASCHKENASI. Ger. 299,300, 1914. By the addition of the necessary quantity of alkali to a soln. of  $\text{BaO}_2$  in aq.  $\text{H}_2\text{AsO}_4$  or  $\text{H}_3\text{PO}_4$ ,  $\text{Ba}_3(\text{AsO}_4)_2$  or  $\text{Ba}_3(\text{PO}_4)_2$  is pptd., and the filtrate contg. the per-salt is then evapd. with slight warming and under reduced pressure; an aq. soln. of a mixt. of  $\text{Na}_2\text{O}_2$  with the primary or secondary alk. salts can also be submitted to evapn. If a soln. of an arsenate, phosphate, or borate in dil.  $\text{H}_2\text{O}_2$  is evapd. to dryness with gentle warming and under reduced pressure, the corresponding per-salt, *e. g.*,  $\text{NaBO}_3$ , can be obtained with scarcely any loss of O.

**Aluminium salts.** W. B. LLEWELLYN, H. SPENCE and P. SPENCE & SONS. Brit. 119,924, Oct. 29, 1917. Addition to 112,881 (*C. A.* 12, 1111). The process of the principal patent is applied to clays, fire-clays, lithomarge, and the like, except such as contain much potash. The materials, which may be ignited if desired, are broken into small pieces for the  $\text{H}_2\text{SO}_4$  treatment, but when they are of a hard character, having a conchoidal fracture, the pieces are preferably of less thickness than would otherwise

be the case, preferably not exceeding  $\frac{1}{8}$  in. The process may be combined with the processes described in 3,805, 1912 (cf. C. A. 7, 2668), and 22,590, 1912 (C. A. 8, 996), in which case the pieces of the raw materials are treated in conjunction with underground coal-measure and like shales in the same vessel in the manner described in the specifications referred to. Cf. also 3,870, 1868.

**Calcium nitrate.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,286,839, Dec. 3.  $\text{CaCN}_2$  is dissolved in  $\text{H}_2\text{O}$  and mixed with a soln. of  $\text{Ca}(\text{NO}_3)_2$  and the mixt. is then treated with nitrifying bacteria and air to effect further production of  $\text{Ca}(\text{NO}_3)_2$ .

**Potassium chloride from saline waters.** G. B. BURNHAM. U. S. 1,286,932, Dec. 10. Saline waters containing K, Na, chloride, sulfate and carbonate, approx. satd. with  $\text{NaCl}$ , are cooled to cryst. out  $\text{Na}_2\text{SO}_4$  and  $\text{Na}_2\text{CO}_3$ , the liquor is removed from the deposited crystals and its temp. is sufficiently raised to evap. off a portion of the  $\text{H}_2\text{O}$  and effect crystn. of  $\text{NaCl}$  and produce an approx. satd. soln. of  $\text{KCl}$ . The latter is then sepd. and the  $\text{KCl}$  recovered from the soln. by crystn.

**Nitrates by bacterial action.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,286,838, Dec. 3. A porous mass of  $\text{CaCO}_3$  is treated with a soln. of  $\text{Ca}(\text{NO}_3)_2$ ; inoculated with nitrifying bacteria, the porous mass thus prepd. is then treated with a dil. soln. of  $\text{NH}_3$  or other N compds. to be oxidized and compressed air is passed through it to facilitate nitrification.

**Manganese dioxide.** M. L. KAPLAN. U. S. 1,287,041, Dec. 10. Manganous nitrate, mixed with  $\text{NaNO}_3$ , is decomposed by heating at a temp. of about  $170^\circ$  to form  $\text{MnO}_2$  and the  $\text{NO}_2$  liberated in this reaction is used to react on mineral  $\text{MnO}_2$  to produce additional  $\text{Mn}(\text{NO}_3)_2$ . The use of  $\text{NaNO}_3$  together with the  $\text{Mn}(\text{NO}_3)_2$  results in the formation of an artificial  $\text{MnO}_2$  which is readily pulverized and which is suitable for use as a depolarizing material in dry cells.

**Extracting potassium compounds from feldspar.** H. BLUMENBERG, JR. U. S. 1,286,513, Dec. 3. Feldspar is mixed with powdered  $\text{CaCO}_3$  and with acid sludge produced in refining petroleum with  $\text{H}_2\text{SO}_4$  and the mixt. is heated in air to form  $\text{K}_2\text{SO}_4$  and an insol. Ca Al silicate. Temps. of  $700$ – $1000^\circ$  are employed.

**Decomposing potassium-bearing silicates.** H. N. MORSE. U. S. 1,286,718, Dec. 3. Silicates, such as feldspar which has been treated with caustic alkali, which contain K and Al and which are attacked by  $\text{SO}_3$  are heated in a current of  $\text{SO}_3$  to a temp. (preferably about  $250^\circ$ ) at which the  $\text{SO}_3$  reacts with the K but not with the Al.  $\text{K}_2\text{SO}_4$  is formed and then oxidized by the air to  $\text{K}_2\text{S}_2\text{O}_8$ .

**Acid-resisting compositions.** CHANCE & HUNT, A. E. HOLLEY and H. W. WEBB. Brit. 119,966, Jan. 12, 1918.  $\text{PbCO}_3$  or basic Pb carbonate is added to ground acid-resisting siliceous material and then mixed with  $\text{Na}_2\text{SiO}_3$  soln. Proportions are: finely ground stoneware 8, sand 7, less finely ground blue brick 2,  $\text{PbCO}_3$  0.25,  $60^\circ$  Tw.  $\text{Na}_2\text{SiO}_3$  soln. 3.

**Hydrogen peroxide.** R. MORITZ. Brit. 120,145, Oct. 8, 1918.  $\text{H}_2\text{O}_2$  is produced by hydrogenating a tube, ribbon, or wire of Pd or a Pd alloy and then acting with it upon a soln. of O in  $\text{H}_2\text{O}$  or weak  $\text{H}_2\text{O}_2$ . The process may be carried out by passing an endless Pd ribbon or wire through an atm. of H and then through a tube lined with ebonite and contg. a soln. of O; or by passing H through a Pd tube immersed in an O soln. in an Fe tube lined with ebonite; or electrolytically by passing a stream of acidulated  $\text{H}_2\text{O}$  satd. with O over a cathode of Pd or Pd alloy and an anode of Pt, Au, fused Fe oxide, graphite, etc., with or without a diaphragm, preferably in a horizontal Fe tube lined with ebonite, Sn, Ag, rubber, etc. In all cases, the H may be replaced by mixts. such as water-gas and the H and O or air may be under pressure.

**Titanium oxide.** TITANIUM ALLOY MFG. CO. Norw. 28,673, Mar. 25, 1918. The initial material is fused in the presence of a sulfide and an alkali metal, obtaining thereby ferro-Na-sulfide and alkali titanate. The mass is maintained in a molten state until it seps., by gravity, into two portions, one containing more Ti and less Fe than the other.

**Hydrogen.** H. KELLER. U. S. 1,286,650, Dec. 3. H is produced by alternately passing steam and a reducing gas at a high temp. over spongy Fe which has been produced by embedding an O-compd. of Fe, *e. g.*,  $\text{Fe}_2\text{O}_3$ , in C and heating. "Swedish Fe sponge" may be used.

**Nitrogen from combustion gases.** M. SHOELD. U. S. 1,287,472, Dec. 10. A gaseous mixt. containing N and  $\text{CO}_2$ , *e. g.*, gases produced by combustion of coke, is scrubbed with an absorbent of  $\text{CO}_2$  such as  $\text{K}_2\text{CO}_3$  soln. to remove the  $\text{CO}_2$  and obtain N. The soln. obtained is then heated to drive off  $\text{CO}_2$  and the residual soln. then may be reused for further absorption of  $\text{CO}_2$ .

**Aluminium compounds.** NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit. 120,035, July 23, 1918. Al compds. are prepd. from clay, argillite, or similar minerals by treatment with acids in an autoclave under pressure. When  $\text{HNO}_3$  is employed, the pressure is stated to prevent dissociation at the temp. employed. The silicic acid is said to be obtained in a grainy state, and readily separable by filtration.

**Oxygen practically from free chlorine.** CHEM. FABRIK GRÜNAU, LANDSHOFF & MEYER, E. FRANKÉ and F. SCHMIEDT. Ger. 299,505, 1915. By the addition of a small quantity of Ni or Co in the form of metal, oxide, or salt, the "first period" of development of O from chlorates or perchlorates is prolonged;  $\text{CeO}_2$  also can be used as catalyst. The last traces of Cl can be removed from the gas by passing this through a filter of  $\text{MgO}$ , whiting, or anhydrous  $\text{Na}_2\text{CO}_3$ , which may be distributed over some inert material, such as glass wool or asbestos.

**Decolorizing carbon.** R. W. MUMFORD. U. S. 1,287,592, Dec. 10. Decolorizing C adapted for use in decolorizing oils or sugar solns. is produced by placing a dough-like mass of comminuted vegetable material such as coal, peat, sawdust or lignite, mixed with starch or molasses, in thin layers, in mixt. with pulverized dolomitic limestone and heating progressively to above  $800^\circ$ , dumping the carbonized product into  $\text{H}_2\text{O}$  while excluding air, removing the mineral matter by sedimentation and then drying the carbonaceous material obtained.

**Carbon-removing composition.** C. A. LEWIS. U. S. 1,287,589, Dec. 10. A mixt. adapted for removal of C from internal-combustion engines is formed of acetone 50% or more, alc. 15-40%,  $\text{H}_2\text{O}$  3-20% and oil of citronella 3% or less.

**Phenolic-formaldehyde condensation product.** J. O. HANDY. U. S. 1,287,299, Dec. 10. A mixt. of commercial "cresylic acid" of 97-99% purity is boiled with such a proportion of 40%  $\text{CH}_2\text{O}$  soln. that the mixt. contains more than one mol.  $\text{CH}_2\text{O}$  for each mol. of cresylic acid and the boiling is continued until the solids, detd. at a temp. of  $110^\circ$ , equal at least 40% of the product and are infusible, hard and tough and insol. in acetone. The final boiling during which  $\text{H}_2\text{O}$  and  $\text{CH}_2\text{O}$  are distd. off is conducted at a temp. of  $110-120^\circ$ . The product obtained by this method is suitable for use as a binder in making brushes and for various other purposes.

**Plastic composition.** J. SANDERSON. U. S. 1,287,453, Dec. 10. A mixt. suitable for use in surgical work and for other purposes is composed of plaster of Paris 41, boiled linseed oil 2, resin 11 and carnauba wax 3 parts.

**Molded electrical insulation from pitch.** J. P. A. MCCOY. U. S. 1,286,370, Dec. 3. Coal-tar pitch is heated sufficiently to drive off its more volatile constituents, preferably at a temp. of about  $260-300^\circ$ , finely divided, then treated with  $\text{C}_2\text{H}_4$  or other

liquid which will cause swelling and softening of the material and molded under pressure. The product is especially intended for use as a binder with fillers such as wood flour or asbestos.

**Molded mixture of sodium silicate and portland cement.** J. P. A. McCoy. U. S. 1,286,371. A dry mixt. of Na or K silicate 1-20 and portland cement 99-80 parts is moistened sufficiently for molding but not sufficiently to dissolve the silicate, the moistened material is molded and the molded article then is subjected to the action of steam to indurate the mass. The material thus formed is suitable for use as a binder with various fillers.

**Electrical insulation.** J. P. A. McCoy. U. S. 1,286,372, Dec. 3. A material suitable for use as an elec. insulation is formed by mixing about equal amts. of pyrogallol and gum arabic with about 5% their weight of trioxymethylene and about 50% of a filler such as sawdust, asbestos or wood flour and then compressing the mixt. in a hot mold.

**Effecting catalytic reactions.** J. WALTER. Ger. 296,507, 1917. Thorough exposure of the catalyst to the reagents is achieved by electromagnetic means. The catalyst itself may be magnetic and if desired spread on a non-magnetic material, or a non-magnetic catalyst may be deposited on a magnetic substance, and parts of the app., such as baffle plates or gauze in a gas tube, or mechanical agitators, are made magnetic or magnetizable. During the reaction, or during the removal of the products, magnetic fields are established and broken by elec. means, so that the catalyst is kept moving, but near the exit of the app. a permanent field is maintained to prevent loss of the agent as dust. Examples given in the original specification include the hydrogenation of train oil, the prepn. of  $\text{CH}_4$  from CO, and the reduction of cinnamaldehyde to  $\beta$ -phenylpropaldehyde and  $\beta$ -phenylpropyl alc., levulose to mannitol, and quinine to di- and tetrahydroquinine.

## 19. GLASS AND CERAMICS.

G. E. BARTON AND A. V. BLEININGER.

**The effect of certain impurities in causing milkiness in optical glass.** C. N. FENNER AND J. B. FERGUSON. *J. Am. Ceram. Soc.* 1, 468-76(1918).—In connection with optical glass making at Bausch & Lomb Optical Co. there was occasional but irregular occurrence of opalescence or milkiness in the light flint glass (containing about 33.5%  $\text{PbO}$  and with  $n_D =$  about 1.572). The cause was sulfate and chloride in Russian potash used after the German supply was exhausted. Even with such impurity no trouble resulted after reliable temp. control was instituted and a finishing temp. of 1400-1420° was maintained. Analyses of potash and of glass samples are given. One analysis of a milky glass showed 0.14%  $\text{SO}_2$  which, after clearing up by heat treatment at 1100° or a little higher, showed only 0.06%  $\text{SO}_2$ . In another case 2 pots of glass made alike except for some possibility of slight temp. difference showed 0.10%  $\text{SO}_2$  and 0.17% Cl for one portion which was milky and 0.05  $\text{SO}_2$  and 0.17% Cl for the other which was clear. Probably the Cl is much less objectionable than the  $\text{SO}_2$ . The milkiness is not due directly to the  $\text{SO}_2$  or Cl but to some result which their presence favors. Evidence indicates that the minute particles causing milky color are submicroscopic crystals of crystalbite. C. H. KERR.

**Effects of heat on chemical glassware.** R. G. SHERWOOD. *J. Am. Chem. Soc.* 40, 1645-53(1918).—In exhausting to high vacuum it is common practice to heat vessels to 200 to 400°. The large quantities of gaseous products obtained can hardly be due entirely to surface adsorption. Expts. are described. Two kinds of gaseous evolution



were found: (1) adsorbed products readily removed below  $300^{\circ}$ , (2) from chem. decompn. of the glass itself, this becoming important above  $400^{\circ}$  for softer glasses (ordinary Na and Pb glasses) and above  $500^{\circ}$  for harder glass (Corning G702P). There seems to be a definite characteristic rate for each temp. C. H. KERR.

**Investigation of clay and shale resources of Canada.** J. KEELE. Canada Dept. Mines, *Summary Rept.* 1917, 97-120.—Results are given on absorption, fire shrinkage tests and color after heating samples from a number of clay deposits in various Canadian provinces. Descriptions of many of the clay beds are also included. A large bed of diatomaceous earth is reported in British Columbia. The earth is a soft, white, chalky material, with little or no plasticity when wet. It makes a good insulating brick when mixed with 25% of good plastic clay and some sawdust, and then molded and burned as in ordinary brick making. Clays suitable for the manuf. of tableware, stoneware goods, art pottery, and flowerpots are also described. The manuf. of magnesite brick is described with chem. analysis of several bricks. Lightly calcined magnesite when wet in amts. varying from 6 to 15% will cohere for molding and can be made into brick shapes. If dead-burned magnesite is ground fine it is possible to mold it in a damp state without a bond in presses. Various samples of quartzite and sandstone were tested to det. their suitability for the manuf. of silica brick. The results showed that there was a tendency to undue swelling under heat treatment common to quartzites. The addition of an impalpable powder to good quartzite was found to make an improvement in the strength of the bricks when burned. Cf. C. A. 12, 1505.

R. L. SIBLEY.

**Semi-translucent illuminating glass.** J. O. HANDY. U. S. 1,287,005, Dec. 10. A white semi-translucent illuminating glass free from "fire" is formed by fusing together a foundation lead soda batch with  $\text{Al}(\text{OH})_3$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{PO}_4$  and NaCl.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Two letters on effect of coal ash on the nature of cement mill potash. A. E. ANDERSON and R. J. NESTELL. *J. Ind. Eng. Chem.* 10, 1030-3(1918).—Exception is taken to assertions made by Potter and Cheesman (C. A. 12, 756) that  $\text{H}_2\text{O}$ -sol.  $\text{K}_2\text{O}$  in fume from cement stacks is largely from the insol.  $\text{K}_2\text{O}$  in the coal dust and raw material; also that  $\text{K}_2\text{O}$  content of coal ash must be figured in calculating liberation. The authors demonstrate (1) that the coal used in cement burning carries comparatively small amts. of  $\text{K}_2\text{O}$ , the av. being only 0.24% for 9 plants investigated, (2) that the amt. of coal-ash  $\text{K}_2\text{O}$  introduced into the kiln is ordinarily very small as compared with amt. of  $\text{K}_2\text{O}$  entering the kiln with the raw material, and (3) that the sum of the insol. and slowly sol.  $\text{K}_2\text{O}$  collected from coal-burning kilns exceeds the sum of the total  $\text{K}_2\text{O}$  contained in the coal and in the raw material mechanically blown from the kiln. B. E. O. RHODES and J. J. PORTER. These authors also contest conclusions drawn by Potter and Cheesman and cite expts. made at the plant of the Security Cement & Lime Co. in Maryland, concluding that the effect on  $\text{K}_2\text{O}$  liberation is not greatly influenced by the low percentages of  $\text{K}_2\text{O}$  in coal used and that by addition of NaCl to raw mixt. the % of  $\text{H}_2\text{O}$ -sol.  $\text{K}_2\text{O}$  in "treater dust" increases at the expense of the acid-sol.  $\text{K}_2\text{O}$ . C. N. WILEY.

The nature of the recombined potash in cement-mill dust. ALBERT R. MERZ and WILLIAM H. ROSS. *J. Ind. Eng. Chem.* 11, 39-45(1919).—The recombined potash of cement-mill dust occurs in the form of a potash slag or impure glass and is due to a

recombination of a portion of the potash volatilized in kiln practice with the ash of the coal used for fuel and to a lesser extent with the siliceous material originally occurring in the raw mix. The extent of recombination would probably be reduced by burning the cement under oxidizing rather than reducing atm. conditions and by any procedure that would introduce  $\text{CaO}$  or  $\text{NaCl}$  into the dust at the hottest part of the kiln. The greater the amt. of potash volatilized the lower will be the proportion that will undergo recombination in the dust.

ALBERT R. MERZ.

**Waterproofing cement.** D. DAVIDSON. U. S. 1,285,636, Nov. 26. About 0.25-1.00% of naphthenic acids such as are obtained in refining Russian petroleum are added to cement as a waterproofing agent. The acids may be allowed to combine with the lime of the cement or  $\text{BaCl}_2$  or  $\text{AlCl}_3$  may be added to form insol. naphthenates of Ba or Al.

**Artificial stone.** W. WEILER. Swed. 43,945, Apr. 17, 1918. Peat is disintegrated by freezing, the mass is mixed with a binder such as cement, and molded.

**Treating wood.** L. PATERSEN-HVID. Swed. 43,965, Apr. 24, 1918. In a process of preserving and coloring wood, the articles are subjected to the action of steam in a closed vessel together with  $\text{NaOH}$  or the like, which collects at the bottom of the vessel, and  $\text{NH}_3$  which serves to neutralize the organic acids formed by the action of the steam, the volatile  $\text{NH}_3$  salts being decomposed by the  $\text{NaOH}$  with the liberation of the  $\text{NH}_3$  for continued action.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**The fusibility of coal ash and the determination of the softening temperature.** A. C. FIELDNER, A. E. HALL, AND A. L. FEILD. U. S. Bur. Mines, *Bull.* 129, 118 pp. (1918).—An exptl. study reported in detail with a review of the literature, discussions, illustration, curves, tables, etc. "The publication gives the effect of various oxidizing, reducing, and neutral atms. such as are found in various parts of the fuel bed on the softening temp. of ash when molded in the form of Seger cones. A practical method of detg. fusibility has been developed whereby the ash is caused to soften and form slags in which the Fe exists in approx. the same state of oxidation as the Fe in fuel-bed clinkers. Although it is believed that this method will indicate the probable clinkering characteristics of a coal better than any fusion tests heretofore described, the bureau does not recommend the general use of this method in coal specifications until it is justified by actual trial in furnace tests of different coals. As no fusibility test of a well mixed sample of the av. ash of a coal takes into account the physical distribution of the impurities in the coal as burned, much additional investigation is needed to establish the exact relation of these lab. fusibility tests to clinker formation." *Summary and conclusions:* "Attention is called to the empirical nature of the 'fusing or softening-temp.' test and the necessity of adopting some standard and duplicatable method if it is to be used in specifications for the purchase of coal. The influence of the more important factors affecting the softening temps. of the coal ashes tested are: *Fineness of ash:* Ash ground to an impalpable powder tended to soften at a slightly lower temp. than ash that would pass a 100-mesh screen. The difference averaged  $6^\circ$ , and in no test exceeded  $40^\circ$ . Ash pulverized to at least 200-mesh was preferred, as it could be molded into more substantial cones than 100-mesh material. *Inclination of cones:* Mounting the cones with a considerable inclination ( $35^\circ$  or  $40^\circ$  from the vertical) caused premature deformation points in some cones, which bent only at or near the

base at a comparatively early stage in the fusion process, before the ash had softened to the flowing point. Vertical or nearly vertical cones were more free from this source of variation. Horizontally mounted cones usually gave lower softening points than vertical cones, the difference varying from  $0^{\circ}$  to nearly  $200^{\circ}$ . The av. difference for 15 samples was  $49^{\circ}$ . In general, horizontal or inclined cones indicated a softening point at too early a stage in the fusion process; hence vertically mounted cones are recommended. *Size and shape of cone:* The deformation of a cone depended to some degree on its size and shape. Within limits of 0.5–2.5 in. high the actual size had little influence provided the shape was the same, *i. e.*, the ratio between the dimensions of the base and of the altitude. Cones made of coal ash did not bend as uniformly as the standard pyrometric cones. Attempts to modify the ratio of base to altitude in order to obtain a more uniform deformation, like the usual Seger-cone bend, resulted in the selection of a rather slender type of cone—each side of base  $\frac{3}{16}$  in.; altitude, 1 in.—as having less tendency to soften to a lump without a bending. Later experience showed that certain ashes when molded into slender cones would bend when only a relatively small part of the ash mixt. had fused, thus indicating a premature softening temp.; it was also impossible to prevent some ashes from fusing down to a lump even with the slender type of cone. It was, therefore, decided to eliminate entirely the bending tendency by increasing the width of the base; and to take as the softening temp. the point where the cone had softened and flowed down to a somewhat spherical lump. The optimum size for this purpose was found experimentally to be a cone  $\frac{3}{4}$  in. high and  $\frac{1}{4}$  in. wide at the base. This end point was found reproducible within  $30^{\circ}$ , and was practically free from the occasional large variations experienced with the slender bending cones. *Carbonaceous matter in the ash:* Tests in which all traces of C were removed and in which the cones were made up exclusively with distd.  $H_2O$ , showed no appreciable difference in softening temp. when compared with similar tests in which the same ashes were made into cones with 10% dextrin soln. which was not burned out before the cones were inserted in the furnace. These tests were made in atms. of air, of H and  $H_2O$  vapor, and of CO and  $CO_2$  at rates of heating not exceeding  $5^{\circ}$  per min. In certain tests in the gas furnace with a reducing atm., more rapid rates of heating caused swelling and intumescence, which was much less pronounced when the ash was previously ignited in O for 2 hrs. In routine work, ignition of the reground ash in O promotes more definite and reliable softening points, especially when the original ash has been incompletely ignited. *Rate of heating:* In general, slower rates of heating gave lower softening points. Rates slower than  $2^{\circ}$  or faster than  $10^{\circ}$  per min. are not advisable. The effect of variations between these limits in purely oxidizing atms. was negligible. In a reducing atm. of H the lowest and most uniform results were obtained with a heat increase of  $2^{\circ}$  per min.; however, a temp. increase of  $5^{\circ}$  per min. until initial deformation of the cone occurred, and then reducing the rate to  $2^{\circ}$  per min. gave practically the same results and saved considerable time in making the test. In the gas furnace with reducing atm., the optimum rate of temp. increase was between  $5^{\circ}$  and  $10^{\circ}$  per min. These limits are recommended for a standard rate of heating. *Oxidizing or reducing atm.:* The atm. in which the ash was heated proved by far the most important factor in causing large variations in the softening temp. The highest softening points were obtained either in an atm. of air (Pt-wire resistance furnace), or in a strongly reducing atm. of CO (Northrup furnace), which prevented the Fe oxide from acting as a fluxing agent by reducing it to metallic Fe before the softening of the ash began. The lowest softening temps. were obtained in those atms. of mixed gases in which reduction of  $Fe_2O_3$  proceeded mainly to FeO, the most active phase in the reduction of Fe ore as regards slag formation at lower temps. The max. variation in softening temps. due to differ-

ent atms. ranged from  $134^{\circ}$  to  $396^{\circ}$ . *Fusibility of ash in various mixts. of H and H<sub>2</sub>O vapor:* The softening temps. of 5 different coal ashes were detd. in various mixts. of H and H<sub>2</sub>O vapor, ranging from 100% H to 100% H<sub>2</sub>O vapor. These results, plotted in the form of curves, showed that for each of the ashes tested there was a high softening temp. in pure H on one end owing to reduction of Fe oxide to metallic Fe; similar high softening temp. in H<sub>2</sub>O vapor or air on the other end owing to the Fe oxide remaining for the most part in the form of Fe<sub>2</sub>O<sub>3</sub> or Fe<sub>3</sub>O<sub>4</sub>; and a somewhat lower softening temp. in the middle part; in an atm. ranging from 30 to 70% H<sub>2</sub>O vapor, owing to the reduction of most of the Fe to the Fe<sup>++</sup> state, in which it combined to form fusible Fe<sup>++</sup> silicates. *Fusibility of ash in various mixts. of CO and CO<sub>2</sub>:* Softening-temp. tests in various mixts. of CO and CO<sub>2</sub> were also made with 4 of the ashes that had been tested in mixts. of H and H<sub>2</sub>O vapor. Softening-temp. curves similar to the curves obtained in tests with atms. of H and H<sub>2</sub>O vapor were obtained, each having a minimum region of fusion between approx. limits of 75 and 10% CO. It was found necessary to heat the ash cones more slowly in CO-CO<sub>2</sub> atms. to attain approx. the same minimum point as was found in H<sub>2</sub>-H<sub>2</sub>O atms. at faster rates of heating. Even with a slower rate of heating in the former atm. the av. difference in the minimum softening temps. (down points) of a series of ashes tested in the 2 atms. was  $66.1^{\circ}$ . The max. difference was  $197^{\circ}$ . The results obtained in H<sub>2</sub>-H<sub>2</sub>O atms. were generally lower than in CO-CO<sub>2</sub> atms. The initial deformation points were practically the same in CO-CO<sub>2</sub> and in H<sub>2</sub>-H<sub>2</sub>O atms. *Fusibility of ash in the reducing atm. of a gas furnace:* It was found possible so to operate 2 types of gas furnaces, in which the combustion products had free access to the coal ash, that an atm. of approx. 60% oxidizing and 40% reducing gases was maintained around the coal ash. Softening temps. similar to those previously obtained in mixts. containing equal parts of CO and CO<sub>2</sub> were thus obtained in a much simple type of furnace. By operating the gas furnace with the max. excess of gas over air, the desired reduction of Fe<sup>+++</sup> to Fe<sup>++</sup> was obtained without the production of any metallic Fe. *State of oxidation of Fe in ash cones fused in various atms:* Ash cones fused in oxidizing atms. of air, CO<sub>2</sub>, and H<sub>2</sub>O vapor contained 67 to 88% of the total Fe in the Fe<sup>+++</sup> form; in reducing atms. of H and CO, 49 to 78% of the Fe was present as metallic Fe. In mixts. containing equal parts of H<sub>2</sub> and H<sub>2</sub>O or of CO and CO<sub>2</sub>, 78 to 94% of the Fe was present as Fe<sup>++</sup>. *State of oxidation of Fe in clinker and slags:* Analyses of clinker-slugs from 2 different boiler furnaces and one hand-fired exptl. furnace showed that fuel-bed conditions are such as to favor the formation of clinkers containing Fe principally in the Fe<sup>++</sup> state as was found in ash cones fused in mixts. of equal parts of H<sub>2</sub> and H<sub>2</sub>O or of CO and CO<sub>2</sub>. *Standard method of detg. the softening temp. of coal ash:* The method of detg. the softening temp. of coal ash in a gas furnace with a reducing atm. is recommended as a standard method. The furnace is simple, it can be easily operated, and a no. of tests can be made simultaneously. When a furnace is operated under the prescribed reducing conditions reproducible results can be obtained, approximating those of the more definite mixts. of equal proportions of CO and CO<sub>2</sub>. A standard furnace design and procedure are recommended."

F. W. SMITHER.

*Fusibility of coal ash in West Virginia coals.* WALTER A. SELVIG. *Chem. Met. Eng.* 19, 826-8(1918).—Test made at the Bur. of Mines to det. clinkering properties of certain coals for industrial use. The method employed was the standard gas furnace method of the Bur. of Mines (cf. preceding abstract). The coal samples, ground to 60-mesh, are placed in shallow fire-clay roasting dishes and completely ashed at a temp. of  $800-900^{\circ}$ . This ash is then ground in an agate mortar to pass a 200-mesh sieve. To ensure complete ashing, the ash is then placed in fused silica capsules and ignited at  $800^{\circ}$  for 2 hrs., O being passed through the furnace meanwhile. A portion of the ash is

transferred to an agate mortar, moistened with a 10% dextrin soln. and worked into a plastic mass with a spatula. It is then molded into solid triangular pyramids 0.75 in. high by 0.25 in. wide at the base. These cones are then removed, dried and mounted in a vertical position in a refractory base made up of a mixt. of 2 parts kaolin to 1 of calcined alumina. Usually 5 cones are mounted in the same base. The base with the cones is dried over a hot plate until all  $H_2O$  is driven off; then the dextrin is burned out of the cones by igniting them in a muffle furnace at a dull red heat, after which the cones are ready for use. The furnace used was a No. 3 melter's furnace of the American Gas Furnace Co., natural gas and air pressure of 2-3 lbs. to the sq. in. being used. The cones, on a suitable mounting, are placed within a covered fire-clay crucible. For observation purposes a fused silica tube with a thin glass window is placed in a 2-in. hole drilled through the furnace jacket and fire-clay crucible. At right angles to this a 0.25 in. hole is drilled through the furnace and crucible, through which a Pt-Rh thermocouple, protected by a glazed porcelain tube, is inserted. A reducing atmosphere is maintained within the furnace by using the min. amt. of air necessary for combustion. Under these conditions, the iron in the ash is reduced to the ferrous state, which condition gives the lowest melting points and therefore the lowest temp. at which clinkering may result. The temp. is gradually increased to  $800^\circ$  when the rate is slowed down to not less than  $5^\circ$  nor more than  $10^\circ$  per min. and maintained to the end of the test, when a max. temp. of  $1500^\circ$  ( $2732^\circ F.$ ) is attained. If higher temps. are needed to fuse the cones, a Mo wire resistance furnace with an atm. of H can be used. However, a coal whose ash fuses above  $2730^\circ F.$  should cause little trouble due to clinker formation. The temp. readings taken were: (1) The initial deformation temp. The temp. at which the first bending of the apex of the cone takes place. (2) The softening temp. The temp. at which the cone has fused down to a spherical lump. A summary of tests on W. Va coals, including the Monongahela, Conemaugh, Allegheny and Pottsville, is given.

J. L. WILEY.

(Carbon disulfide elimination from benzene.) Inaugural address (Midland Section Gas Engineers). J. A. WILSON. *Gas World* (Coking and By-Products Sec.) 69, No. 1794, 13-15(1918); *Gas. J.* 144, 465-7(1918).—W. described his process for eliminating S present as disulfide from com. benzene (cf. C. A. 11, 703). The method consists in washing with NaOH at a temp. just below the b. p. of benzene. The following details of a complete washing are given: Forerunnings charged to mixer 1241 gals., sp. gr. 0.907,  $CS_2$  8.83%. First wash NaOH 715 gals. of  $27.5^\circ Tw.$ , sp. gr. after run 0.892,  $CS_2$  3.57% = 59.55% reduction. Second wash. Treated spent liquor from first wash 550 gals., sp. gr. after run 0.885,  $CS_2$  0.396% = 35.96% reduction. Total disulfide removed = 95.51%.

J. L. WILEY.

The rational utilization of coal. RENÉ MASSE. *Chimie & Ind.* 1, 665-73(1918).—A plan for conserving the coal resources of France by gasifying the entire production, recovering the by-products, and utilizing the gas and tar oils in engines for production of elec. energy. M. advocates placing all the plants under centralized control and at central stations located at the mines.

J. L. WILEY.

A rapid volumetric method for the determination of sulfur in coal and coke. R. M. STRICKER. *Chem. Analyst* 26, 6(1918).—Ignite 1 g. pulverized coal or coke in a Pt crucible with 1 g. Eshka mixt. until all the C is consumed. Place the residue in a 120-cc. beaker, wash the crucible with 25 cc.  $H_2O$ ; boil 2 min. and decant through a filter. Wash with 2 more 25-cc. portions., finally wash with 10 cc.  $H_2O$  and discard both residue and filter. Add 2 drops HCl in excess to acidify filtrate, add 25 cc. benzidine reagent (6.7 g. benzidine in 18 cc. 1.17, HCl dild. to 1000 cc.), stir rapidly during the addition, allow to settle 15 min. in cold  $H_2O$  or until at about  $20^\circ$ , filter, wash three times with cold  $H_2O$  (15 cc.). Transfer the filter to a 350 cc. erlenmeyer, add 100 cc.

H<sub>2</sub>O and agitate until the paper is disintegrated. Add several drops phenolphthalein and titrate with standardized Ba(OH)<sub>2</sub>. Just before the end point is reached, boil 3 min. and carry the titration to a faint 5 min. pink. H. M. LANCASTER.

Peat in 1917. C. C. OSBON. U. S. Geol. Survey. *Mineral Resources of U. S.*, 1917, Part II, 257-83 (Preprint No. 20, published Dec. 19, 1918). E. H.

Power alcohol—proposals for its production and utilization in Australia. THOMAS R. LYLE, *et al.* Commonwealth of Australia, Advisory Council of Sci. and Ind., *Bull.* 6, 69 pp.(1918).—Owing to the fact that Australia has as yet no domestic supply of mineral oils, and to the fact that the price of such oils, which at present are imported, has steadily risen, a committee was appointed to investigate the production and use of alc. as a fuel for internal-combustion engines. It is concluded that: The world's supply of liquid mineral fuels is not sufficient to meet the demand which is rapidly increasing. Enterprises for the production of mineral oils in Australia have not so far proved successful. Climatic conditions in that country are, however, favorable for the growth of plants containing sugars and starches, from which alc. can be manufd. Alc. is in every way suitable for use as a liquid fuel, and possesses certain advantages over petroleum. The calorific value of alcohol is 11,000 B. t. u. per lb., compared with 18,500 B. t. u. for petroleum. But owing to the greater degree of compression that can be used with alcohol without danger of pre-ignition, a thermal efficiency of 30% can readily be obtained in a properly designed alc. engine, as against 20% in a petroleum engine. From a technological standpoint, the most suitable raw material at present available is the sugar molasses now wasted in Queensland. Since the one source would not meet requirements the cultivation of sorghum grain was suggested as being desirable. The results of the engine tests show that alc. can be used with entire success in internal combustion engines. The distillates obtained from coal-tar oil at a temp. of 170-230° meet the requirements of a good denaturant for alc. to be used as a fuel.

J. H. YOUNG.

Crops for the production of power alcohol. W. R. GRIMWADE. Commonwealth of Australia, Advisory-Council of Sci. and Ind., *Bull.* 7, 153-61(1918).—The importance of alc. as a substitute for gasoline is pointed out and data are presented regarding price, source, and production of alc. The factors influencing the selection of a crop for its production are fully outlined, and stress is placed upon the fact that the commercial success of the industry rests mostly with the proper choice of the crop.

R. B. DEEMER.

Benzene superior to gasoline as auto fuel. ANON. *Gas Age* 42, 548-50(1918).—Report (with tables and curves) of a comparative test made by the Automobile Club of America. The test shows that 90% benzene gives a higher brake h. p. with less fuel consumption.

F. W. SMITHER.

Illuminating gas as motor fuel. P. H. HENDRIKS. Rotterdam. *Het Gas* 38, 147-51(1918).—A discussion of the use of illuminating gas as fuel for automobiles, taking up the methods and difficulties of application and the advantages to be gained.

JULIAN F. SMITH.

Manufacture of benzene from coal gas. G. F. VAN LIMBORCH VAN DER MEERSCH. Amsterdam. *Het Gas* 38, 124-6(1918).—A description and diagram of an installation for recovering the volatile oils from 60,000 cu. m. of gas per day. J. F. S.

Benzene and naphthalene recovery. HAROLD E. COPP. *Gas J.* 144, 311-3 (1918); *Gas World* 69, 265-6(1918).—The method described performs the double function of removing the benzene as well as the naphthalene from the gas by means of creosote. The benzene plant is situated at the inlet to the purifiers and comprises scrubber, heat exchanger, oil superheaters, crude benzene still using live steam, analyzer, main

condenser, separator, and oil coolers. The process is continuous. To sep. the naphthalene fractions from the crude benzene a small supplementary condenser has been installed between the still and the main condenser. In this new member, a very fine regulation of temp. at 92-98° has to be ensured; this is realized by its smallness and structural details. It is interesting to note that while the crude gas at the inlet of the oil scrubber contains an av. of 16.8 grains of naphthalene per 100 cu. ft. of gas, the scrubber had absorbed the whole of the naphthalene. From 24-30 lbs. are recovered every day, this being the equiv. of 16 grains per 100 cu. ft. The remaining 0.8 grain passes with the crude benzene to the storage tank. Since the introduction of the small condenser, the naphthalene content of the wash oil has been reduced from 20-25% to only 6%. The wash oil is kept in better working condition and lasts longer. The quality of the benzene is also improved; it formerly avgd. about 51% and has now risen to 71%. The working of the purifiers has also improved, the material showing no signs of the presence of naphthalene. Since the process was started no vaporized oil has been introduced into the gas.

J. L. WILEY.

**Toluene recovery.** R. S. McBRIDE, C. E. REINICKER AND W. A. DUNKLEY. *Bur. Standards, Tech. Paper 117*, 60 pp.(1918); cf. *C. A.* 12, 864.—A description of toluene plant construction and operation a discussion of the various results which can be obtained, and a brief outline of the cost of carrying out this recovery.

J. L. WILEY.

**Low-temperature distillation of Illinois and Indiana coals.** G. W. TRAEER. *Bull. Am. Inst. Mining Eng.* 1919, 98; cf. *C. A.* 13, 255.—In reply to discussions T. emphasizes the economy of his process as regards initial cost and operating requirements. Observations already made indicate a "through-put" of at least 12 tons for each oven per day.

J. L. W.

**Estimation of naphthalene in coal gas.** HAROLD G. COLMAN. *Gas J.* 144, 231-2 (1918).—It has been found advisable to modify the method published by Colman and Smith 18 yrs. ago (cf. *Gas J.* 75, 798). The app. consists of 4 wash-bottles in series; the first is of glass with glass stopper, the second preferably a narrow-mouthed bottle of about 250 cc. capacity fitted with a rubber stopper carrying an inlet and outlet tube. All connections should be of glass tubing as naphthalene is rapidly absorbed by rubber. The first bottle is charged with a 10% soln. of citric acid to remove any  $\text{NH}_3$  in the gas which would otherwise be absorbed by the picric acid and counted as naphthalene in the test. The second is charged with 100 cc. of 0.05 *N* picric acid; and the third with 50 cc. of the same soln. The fourth is left empty to catch any picric acid carried over in the gas. The standard picric acid soln. is prepared as follows: 35 g. of picric acid are dissolved in 600 cc. of boiling water, the hot soln. is poured into a Winchester qt. bottle containing 1800 cc. of cold water, and the contents are well shaken. When cold the soln. is filtered from sepd. picric acid, and 50 cc. of the filtered soln. are titrated with 0.1 *N* NaOH, using lacmoid or phenolphthalein as indicator. From the amt. of 0.1 *N* NaOH required to neutralize 50 cc. of the soln., the quantity of water necessary to make the soln. exactly 0.05 *N* is calcd. After the app. is charged, connected to the gas supply, and tested for tightness, the gas is passed through it at a rate not exceeding 1 cu. ft. per hr. up to about 10 cu. ft., the temp. of the gas and the barometer reading being noted at the beginning and end of the test as well as the vol. of gas passed, and the vol. corrected to 60° F. and 30 in. of Hg. The contents of the second picric acid bottle and any splashings in the last bottle are washed into the first picric acid bottle, this bottle being then closed by a tightly fitting rubber stopper fitted with a glass stopcock. The bottle is then evacuated by an air-pump until the naphthalene picrate ppt. rises to the surface of the liquid. The stopcock is then closed, the bottle placed in a water bath and heated and shaken until the naphthalene picrate

has dissolved. It is then cooled completely, occasionally being shaken to redissolve any naphthalene which may condense in the upper part of the bottle. Thus the whole of the naphthalene in the gas is converted into naphthalene picrate. When cold the contents of the bottle are poured into a 250 cc. measuring cylinder and the total vol. noted. The naphthalene picrate is then sepd. by filtering through a dry filter paper, rejecting the first few cc. which are weaker than the rest owing to picric acid being taken up by the filter paper. The remainder of the filtrate is then collected and 100 cc. of it titrated with 0.1 *N* NaOH, using the same indicator as before. The number of grains of naphthalene per 100 cu. ft. of gas may then be calcd. by the formula  $(V - V^1) \times 100 \times 0.1975 / \text{vol. of gas passed in}$  in which  $V$  = vol. of 0.1 *N* NaOH required to neutralize the vol. of 0.05 *N* picric acid taken, and  $V^1$  the vol. of 0.1 *N* NaOH required to neutralize the total vol. of picric acid soln. after heating and filtering. J. L. WILEY.

**Combining gas plants and coke ovens.** C. BERTHELOT. *Chimie & Ind.* 1, 471-80, 601-16(1918).—B. holds that the modern tendencies of the coking industry are toward the general use of the semi-direct process for  $(\text{NH}_4)_2\text{SO}_4$  manuf.; the fractionation of gas into 2 parts, one of 4500 cal. for city, industrial and domestic use, and the other of 3000-3500 cal. for heating the ovens; or, heating the ovens either by producer gas or blast furnace gas. The economic advantages of each of these tendencies are discussed, special stress being placed upon the conditions tending toward a combination of all the advantages of both gas plants and coke ovens into one installation. J. L. WILEY.

**Commercial "concentrated ammonia liquor" and its impurities.** HAROLD G. COLMAN AND E. W. YEOMAN. *Gas J.* 144, 567-8(1918); *Chem. Trade J.* 63, 421(1918).—Com. concd.  $\text{NH}_3$  (25%) manufd. largely for the prepn. of ammonium salts usually contains a considerable amt. of impurities of the crude liquor from which it is obtained.  $\text{H}_2\text{S}$  is almost always present, the amt. of which as specified by the govt. should not exceed 0.5%. It varies in the different samples from 0 to 3.1%.  $\text{CO}_2$  in many cases was absent and was usually present only in small amts. The liquor always contains phenols; in a few samples tested the figure ranged from 0.11 to 0.37 g. per 100 cc. Pyridine bases are always present, the av. being 0.26 g. per 100 cc.  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  was found to vary from 0.08 to 0.25 g. per 100 cc., the quantity probably increasing during continued storage with access of air. No complaint was received, however, of any prejudicial effect due to presence of considerable amts. of this substance. With regard to cyanogen compds., the total amt. should not exceed 0.01 g. per 100 cc. for the manuf. of  $\text{NH}_4\text{NO}_3$ . It was found that the quantity greatly increases the longer the liquor stands, and at the end of 40 days was as high as 0.0334 g. per 100 cc. An interesting fact also is that the amt. found in gas-works liquor is considerably less than in coke-oven liquor, the resp. av. of 10 samples being 0.0245 and 0.1080 g. per 100 cc. This is attributed to the fact that the liquor on the gas-works is stored, during which time, by the action of O, the free cyanide is mostly converted into thiocyanate. To improve the quality of the concd. liquor, it is remarked that the purity of the liquor depends very largely upon the preheating process for removing the  $\text{CO}_2$  and  $\text{H}_2\text{S}$ . The cyanogen impurities can be affected by the addition of lime in distn. in sufficient quantity to ensure that all the  $\text{NH}_4$  salts are decomposed. A further plan is the passing of air along with the steam through the  $\text{NH}_3$  still; the total cyanogen, calcd. as  $\text{NH}_4\text{CNS}$ , is reduced at the end of a run of a week from 0.083 to 0.0304 g. per 100 cc., the HCN being converted into thiocyanate which passes away with the waste liquor. A further method is the treatment of the gases passing from the still, between that point and the reflux condenser, with a mixt. of  $\text{FeSO}_4$  and NaOH for the removal of the HCN. In some cases, a lime washer is already put in at this point to absorb any  $\text{H}_2\text{S}$  and  $\text{CO}_2$  which have not been removed in the preheater, while adding S as such to the lime tends



to retain the HCN as thiocyanate. Also in *J. Soc. Chem. Ind.* 37, 319-247(1918).  
J. L. WILEY.

Methods of analysis used in the coal-tar industry. IV. Benzene and light oil. J. M. WEISS. *J. Ind. Eng. Chem.* 10, 1006-12(1918).—The fourth paper of a series (cf. *C. A.* 12, 2123, 2681; 13, 179) describing in detail with illustrations of app., the methods used by The Barrett Co.  
F. W. SMITHER.

Oils from coal tar. C. GOLDSCHMIDT AND R. FRIEDLAENDER. *J. Ind. Eng. Chem.* 10, 1021(1918).—A note on the pamphlet recently issued by the authors calling attention to the advantages and possibilities of their so-called "liquefaction process" for the synthetic manuf. of oils from coal tar.  
F. W. SMITHER.

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Treatment of crude ammonias (HUTIN) 18.

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VLACHOS, WILLIAM: Coal-Tar Intermediate Plants. Philadelphia: Press of Review Publishing and Printing Co. 55 pp. Written for underwriting purposes.

Twenty-Third Annual Report of Massachusetts Gas and Electric Light Commission. Boston: Board of Gas and Electric Light Commissioners. 725 pp.

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Fuel. D. MARKLE. U. S. 1,287,382, Dec. 10. A fuel mixt. is prepd. by mixing anthracite culm 100 with hard pitch 15-35 parts and heating the mixt. at a temp. sufficiently high (700° or above) to distill off the volatile constituents of the pitch without forming coke. The product may be used similarly to anthracite.

Producing gas. H. F. FREULER. U. S. 1,286,577, Dec. 3. Gas is produced by first electrically heating a mass of charcoal or other C fuel with a current of comparatively high voltage, reducing the voltage to regulate the temp. of the mass, and then injecting superheated steam into the mass to effect its decompn. with formation of CO and H.

Gas producers. F. W. CHAMIER, H. J. CRAIG and J. F. O. MOELLER. Brit. 120,051, Dec. 21, 1916. In the manuf. of power gas, the amt. of light oil obtained from the fuel is increased by treating the fuel in 2 successive stages, a low-temp. stage in which steam mixed with gas obtained from the second stage is passed through the fuel, and a high-temp. stage in which the final combustion of the fuel is effected by mixed steam and air. A suitable app. is specified.

Ammonium chloride. H. BAKER. Brit. 119,971, Jan. 22, 1918. Addition to 112,329 (*C. A.* 12, 992). The principal process is modified by evapg. the ammoniacal liquor to a desired concn., or to dryness during or after the liberation of the  $\text{NH}_3$ , and then treating the concd. soln., or the residue, after again dissolving in  $\text{H}_2\text{O}$ , with a metal compd. to remove the cyanides, the filtrate being then treated with  $\text{H}_2\text{S}$  or unpurified coal gas to remove excess of the precipitant and the purified soln. being evapd. to dryness as described in the parent specification. The  $\text{H}_2\text{S}$  may be obtained from the original gas liquor or from other  $\text{NH}_3$ -recovery processes.

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## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

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F. M. ROGERS.

The passing of petroleum. ANON. *Engineering* 106, 633-5(1918).—A review and discussion based mainly on a recent report by Gilbert and Pogue of the Division of Mineral Technology, U. S. Natl. Museum.  
F. W. SMITHER.

**Petroleum hydrology applied to Mid-Continent Field.** R. O. NEAL. *Bull. Am. Inst. Mining Eng.* 1919, 1-8.—This paper deals with the application of chem. analyses as a means of distinguishing between waters that encroach upon oil-bearing beds from sources in the same stratum and waters that reach the oil sands from horizons above. Tables of analytical data accompany the text. F. W. SMITHER.

**Transformer oil.** W. S. FLIGHT. *Electrician* 81, 636, 664, 686(1918).—Fixed oils often give trouble through the formation of sludge, while straight oils are freer from this defect. For transformers, sp. gr., viscosity, flash point and dielec. strength are important considerations. Moisture content is very important and in use care must be taken to prevent the oil from taking up moisture. Tests and methods of making them are described in some detail. Practical methods of preventing sludge are discussed. W. E. RUDER.

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**Benzene superior to gasoline as auto fuel (ANON.) 21.**

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**Distilling petroleum and the like.** M. J. TRIMBLE. *Holl.* 2,512, Aug. 1, 1918. The petroleum or the like is converted, in a special form of furnace, into a froth or vapor and liquid which is conducted into a vertical sepg. chamber of known type in which a thin layer of liquid flows down the walls suitably protected from cooling, the vapors formed escaping from various outlets and the chamber being heated from below by superheated steam.

**Purifying cracking agents obtained from mineral oil and sulfuric acid.** E. TWITCHELL. *Swed.* 43,923, Apr. 17, 1918. Cracking agents for fatty substances are boiled with alkali chloride soln. to salt out the alkali salts and compds. analogous to sulfaromatic fatty acids, whereupon the mineral oils are extd. by means of org. solvents.

**Cracking hydrocarbons.** SYNTHETIC HYDROCARBON Co. *Dan.* 23,052, Apr. 29, 1918. A ring-shaped chamber containing a perforated basket charged with metal turnings or the like is disposed in a furnace. The volatilized oils are cracked in contact with the metal.

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## 23. CELLULOSE AND PAPER.

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A. D. LITTLE.

**A paper tearing-resistance tester.** H. N. CASE. *J. Ind. Eng. Chem.* 11, 49-51 (1919).—A piece of paper  $2\frac{1}{2}$  in. long and 1 in. wide is slit lengthwise through the center to within  $\frac{1}{4}$  in. of one end. One of the slit ends is clamped in a fixed jaw and the other clamped to a small weighed bucket. Water is run into the bucket at a uniform rate until the partially slit paper tears through the  $\frac{1}{4}$  in. which remained uncut. The weight of the water in g. is the tearing resistance number. Tables are given showing the results of tests on several different grades of paper. R. B. ROG.

**Photographic paper technology.** ANON. *Paper* 23, No. 17(1919).—A description of the details of manufacturing photographic paper in France. R. B. ROG.

**Recovering alkali and other substances in cellulose production.** O. G. STAGE. *Can.* 187,316, Nov. 5, 1918. The strong black liquor is withdrawn from the cellulose digester and replaced with a weak liquor which washes the pulp; then both the strong and weak liquors are transferred to the furnace for use as fuel therein under heat and pressure without exposure to the air.

**Decomposing sulfite waste to extract organic and inorganic materials.** R. W. STREHLENER. *Norw.* 28,641, Mar. 11, 1918. In a modification of the process of

24,140, the waste is evapd. to 90% of its vol. before decomposing, so that a portion of the lime salt is pptd., and the combined  $\text{SO}_2$  is liberated, thereby facilitating pptn. and increasing the yield of dry product.

**Decomposing sulfite waste to extract organic and inorganic materials.** R. W. STREHLENERT. Norw. 28,655, Mar. 11, 1918. In a modification of the process of 24,140, the  $\text{SO}_2$  is converted into  $\text{SO}_3$  in the presence of small quantities of  $\text{H}_2\text{SO}_4$ .

**Decomposing sulfite cellulose waste lye.** R. W. STREHLENERT. Swed. 43,860, Apr. 3, 1918. The lye is heated in an autoclave under high pressure produced by the introduction of  $\text{SO}_3$  in such amt. that its partial pressure is greater than that of the steam pressure at the prevailing temp., whereby  $\text{H}_2\text{SO}_4$  required for the reaction is formed by oxidation of the  $\text{H}_2\text{SO}_3$ .

**Fiber for paper-making.** C. BRADLE. U. S. 1,286,502, Dec. 3. Fibrous material such as freshly cut stems of *Hedychium coronarium* are prepd. for the manuf. of unbleached paper by treatment with an alk. soln., e. g., a soln. of  $\text{NaOH}$ , at atm. pressure and at a temp. below the b. p., while simultaneously disintegrating the fibers by a beating operation. Organic substances are retained which are usually removed by a washing process and these substances serve to increase the weight of the product.

**Paper pulp.** J. WELLS. Brit. 120,086, Oct. 24, 1917. Material for the production of paper is obtained by heating previously dried and matured papyrus with lime water at temps. not substantially exceeding  $100^\circ$ . Either the dried and mature stalks may be treated, or the inner fiber and pith obtained from such stalks.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**Swiss dyes.** ANON. *Color Trade J.* 4, 4(1919).—Trade reports show that Switzerland is sending a considerable number of dyestuffs into the U. S., many of which are highly desirable colors not made in this country as yet. These dyes are apparently made in Switzerland, but there is the possibility that many of these dyes are made from intermediates produced in Germany.

L. A. OLNEY.

**The use of acid colors in the "dry dyeing" process.** M. FORT. *J. Soc. Dyers Colourists* 34, 226-7(1918).—The remarkable penetrating powers of carbolic acid and related phenols when applied to animal fibers, and the observation that many acid dyes can be dissolved in these solvents has led to a method of dry dyeing (i. e., dyeing from non-aqueous solvents) acid dyes on animal fibers. F. has satisfied himself that stable shades cannot be obtained with acid dyes on animal fibers when there is complete absence of water. Re-distd. phenols free from water do not readily dissolve acid dyes. Commercial cresol has been found to be the cheapest and most satisfactory phenolic solvent. Cresol alone or with 5% of water added is unsuitable, as it causes wool to curl and twist. Various non-aqueous solvents can be used for the main portion of the bath, along with smaller portions of the cresol soln. of the dye. To obtain fastness temp. should be raised to  $50^\circ$ . Data of 5 typical dye baths are given. The general procedure after dyeing is squeezing or hydro-extracting and rinsing with benzoline or naphtha to which 5% of cresol has been added. Cresol and volatile solvents should be recovered by distn. Use of a standing bath would require previous naphtha cleaning of all goods in order to keep the bath clean.

L. A. OLNEY.

**New process for the production of ungreenable aniline black.** ANON. *Color Trade J.* 4, 16-8(1919).—"The Calico Printers Association" and E. A. Forneaux have patented (Eng. pat. 115,278) a process for the production of aniline black on vegetable

fibers by the use of mixts. consisting of aniline, certain primary aromatic amines, HCl or HNO<sub>3</sub>, HCOOH, chlorates of alkali metals as oxidizing agents, and one or more catalysts, Cu or V salts alone or with an org. catalyst. The working of this process is described in minute detail for which the original paper should be consulted.

L. W. RIGGS.

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Exhaust steam at high back pressures (FIELD) 18.

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**Davison's Textile Blue Book, United States and Canada.** Directory of Cotton and Woolen Mills and a Textile Supply Directory. 31st Ann. Ed. New York: Davison Publishing Co. 1471 pp. 55. For review see *J. Am. Soc. Mech. Eng.* 41, 84.

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**Azo dyes of the pyrazolone series.** E. REBER. U. S. 1,286,411, Dec. 3. Aniline, diazotized and combined with 1-(5'-sulfo-3'-carboxy-2'-hydroxyphenyl)-3-methyl-5-pyrazolone in a soln. made alk. with Na<sub>2</sub>CO<sub>3</sub>, yields a yellow powder when the dye is salted out in the form of its Na salt, sol. in H<sub>2</sub>O but difficultly sol. in alc. even when heated. In an acid bath, this dye produces greenish yellow on wool, which is rendered fast by subsequent chromating. It may also be used to dye cotton with Cr mordants. By substituting *m*- or *p*-aminobenzoic acid for aniline as starting material, a similar dye is obtained. Other pyrazolone compds. such as the following, may also be substituted as starting materials: 1-(5'-chloro-3'-carboxy-2'-hydroxyphenyl)-3-methyl-5-pyrazolone, 1-(4'-carboxy-3'-hydroxyphenyl)-3-methyl-5-pyrazolone. Dianisidine, when substituted for aniline, produces a dye giving tile-red shades on wool and also giving a red on cotton.

**Nitrogenous vat dyes of the anthracene series.** CHEM. FABRIK GRIESHEIM ELEKTRON. Ger. 301,554, 1918. The yellow vat dye obtained by the action of concd. alc. alkali on pyrazoleanthrone forms alkali salts which react with the usual alkylating agents. The alkyl derivs. so formed are much deeper in color than the parent dye; *e. g.*, the benzyl compd. is scarlet, and the Et deriv., Bordeaux-red.

**Acyl derivatives of aminonaphthols and their sulfonic acids.** CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger. 295,767 and 296,446, 1917. Aminonaphthols and their sulfonic acids are treated with 2-hydroxy-3-naphthoyl chloride or its acetyl deriv., giving naphthoylamino compds. which have a great affinity for cotton and silk. Thus, 2-amino-5-naphthol-7-sulfonic acid yields 2,2'-hydroxy-3'-naphthoylamino-5-naphthol-7-sulfonic acid, as an almost colorless, cryst. mass, which is fixed by cotton in an alk. soln. or by silk in HOAc soln., and may be coupled with diazonium salts on the fiber. 2,2'-Hydroxy-3'-naphthoylamino-8-naphthol-6-sulfonic acid, 1,2'-hydroxy-3'-naphthoylamino-8-naphthol-3,6-disulfonic acid, 1,2'-hydroxy-3'-naphthoylamino-7-naphthol, *m.* 198-200°, are pale gray, cryst. masses or powders.

**1,5-Dihydroxynaphthalenedicarboxylic acid.** FRANZ VON HEMMELMAYR. Ger. 296,035, 1917. 1,5-Dihydroxynaphthalenedicarboxylic acid is a yellow powder, *m.* about 300° (with decompn.), and forms colorless alkali salts, which exhibit blue fluorescence in H<sub>2</sub>O and may be easily "salted out." The acid and its salts combine with wool fibers, subsequent treatment with chromic acid or chromates giving very pure brown tones.

**Dyes suitable for pigment manufacture.** BADISCHE. Ger. 296,991, 1917. Diazotized 1-aminoanthraquinone is coupled with 1-benzoylamino-7-hydroxynaphthalene, or the substituted benzoylamino analogs, in the presence of Turkey-red oil, or such substances, with or without a substratum. The 8-benzoylamino- $\beta$ -naphthol,

m. 208-9°; 8-*o*-chlorobenzoylamino- $\beta$ -naphthol, m. 158-60°; 8-*p*-chlorobenzoylamino- $\beta$ -naphthol, m. 230-1°; 8-*o,p*-dichlorobenzoylamino- $\beta$ -naphthol, m. 186-7°; 8,2',6'-dichlorobenzoylamino- $\beta$ -naphthol, m. 227-8°; 8-*m*-nitrobenzoylamino- $\beta$ -naphthol, m. 255-60° (with decompn.).

**Dyes suitable for the manufacture of pigments.** BADISCHER. Ger. 297,414, 1917. Instead of 1-benzoylamino-7-hydroxynaphthalene or its derivs. containing substituents in the benzoyl residue, the corresponding *N*-alkyl compds. can be used. 1-Benzoylethylamino-7-hydroxynaphthalene, 1-benzoylmethylamino-7-hydroxynaphthalene, and 1,2'-chlorobenzoylethylamino-7-hydroxynaphthalene, m. 224-5°, 186-7°, and 232-3°, resp.

**Acid mono-azo dyes for wool.** BAYER & Co. Ger. 296,964, 1917. Good dyes which color wool yellow to bluish red or brown shades in acid baths are obtained by coupling pyrazolone-, methyl-ketol-,  $\alpha$ - or  $\beta$ -naphthol-, or 8-acylamino- $\alpha$ -naphthol-sulfonic acids with diazotized phenylenediamines of the type  $\text{NH}_2\text{R}'\text{NRR}'$ , where R = alkyl or aryl, R' = an aromatic acyl group, such as Bz or  $\text{MeO.C}_6\text{H}_4\text{CO}$ , and R' = the benzene nucleus or a homolog or substituted nucleus. The necessary bases are obtained by treating alkylated or arylated anilines with benzoyl chloride or substituted benzoyl chlorides, nitrating the products, and then reducing the nitro compds. Thus, ethylaniline, after benzylation, nitration, and reduction, yields benzoyl ethyl-*p*-phenylenediamine,  $\text{NH}_2\text{C}_6\text{H}_4\text{NEtBz}$ , m. 114°, and methylaniline gives benzoylmethyl-*p*-phenylenediamine, m. 143°. Benzoylethyl-*m*-toluidine yields benzoylethyltolylene-2,5-diamine, m. 140°; benzoylethyl-*p*-xylylene yields benzoylethyl-*p*-xylylene-2,5-

diamine,  $\text{NH}_2\text{C} \begin{array}{c} \text{CH:CMe} \\ \diagup \quad \diagdown \\ \text{CMe.CH} \end{array} \text{C.NEtBz}$ , m. 134°; benzoylmethyl-*o*-toluidine gives benzoylmethyltolylene-2,4-diamine, m. 167°; 2'-chlorobenzoylethylaniline gives 2'-chlorobenzoylethyl-*p*-phenylenediamine, m. 135°; and 4-nitrodiphenylamine yields benzoylphenyl-*p*-phenylenediamine, m. 178°.

**Triarylmethane dyes fast to light.** FARBWERKE VORM. M. L. & B. Ger. 295,495, 1917. Diarylindyl dyes, which contain an amino-, sulfo-, alkyloxy- or acyloxy group in place of the H atom in the *p*-position with regard to the methane C atom, are treated with primary aromatic amines. The following intermediate compds. are mentioned: *p*-methoxy-*p'*-dimethylaminobenzophenone, m. 133°, from *p*-methoxybenzanilide and dimethylaniline; *p*-hydroxy-*p'*-diethylaminobenzophenone, m. 188°, from *p*-amino-*p'*-diethylaminobenzophenone, which is obtained from the nitro compd., and this from *p*-nitrobenzanilide and diethylaniline; *p*-dimethylaminobenzophenone-*p'*-sulfonic acid, from the above amine by diazotization, treatment with  $\text{H}_2\text{SO}_4$  and Cu paste, and oxidation of the sulfinic acid with permanganate; *p*-amino-*p'*-dimethylamino-*o'*-methylbenzophenone, m. 151°, by the reduction of the product obtained from *p*-nitrobenzanilide and dimethyl-*m*-toluidine; *o*-benzyl-2-methylindole, b. 245° at 16 mm., by melting the phenylbenzylhydrazone of acetone with  $\text{ZnCl}_2$ .

**Developing colors produced on plant fibers with diazotizable dyes.** AKT. GGS. FÜR ANILIN-FABRIKATION. Ger. 303,409, 1917. The dye after diazotization in the usual way, is developed by treatment with an *N*-alkyl deriv. of chloro-*m*-phenylenediamine. 4-Chloro-*N'*-ethyl-1,3-phenylenediamine, colorless crystals, m. 53°, can be obtained by nitrating *p*-chloroacetoethylanilide, followed by removal of the acetyl radical and reduction of the remaining *p*-chloro-*m*-nitroethylaniline. 4-Chloro-*N'*-dimethyl-1,3-phenylenediamine, colorless leaflets, m. 80°, is obtainable by nitrating *o*- $\text{ClC}_6\text{H}_4\text{NMe}_2$  and reducing the resultant nitro compd.

**Vegetable dyestuff and tannic acid.** H. YOSHINAGA. Jap. 32,458, Mar. 29.

1918. The leaves and fruit of vegetables contg. dyestuff and tannic acid are expressed. The resulting liquor is filtered, boiled, and evapd. to dryness.

**Dyeing apparatus.** E. J. WILKINSON. U. S. 1,287,543, Dec. 10. The app. is especially adapted for dyeing piece goods.

**Lake containing titanic oxide.** L. E. BARTON and H. A. GARDNER. U. S. 1,286,916, Dec. 10. White pigments containing  $\text{TiO}_2$  are used as bases for the formation of lakes from dyes such as "paranitraniline reds" or "toluidine reds."

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**Notes on the chemical analysis of red lead.** W. F. EDWARDS. Detroit. *Chem. Met. Eng.* 20, 35-7(1919).—Four well known methods for the detn. of the "true red lead" content of com. red lead are compared. The A. S. T. M. method and that of Lux, as described by Toch, were found to give good results except when the lead had been mixed with oil, even after very careful extn. of the oil. A modification of Mannhart's method in Holly's "Analysis of Paint and Varnish Products," was used, by making a stock soln. of 0.1 *N*  $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  in  $\frac{1}{5}$  *N*  $\text{NH}_4\text{Cl}$ . Moisten 0.5 g. red lead and triturate with water, add 25 cc. stock soln. and 25 cc. concd.  $\text{HCl}$ . Heat and stir the mixt. till the red lead is decomposed and then titrate with 0.1 *N*  $\text{K}_2\text{Cr}_2\text{O}_7$  to det. the excess of  $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ . Each cc. stock soln. consumed equals 0.03428 g. "true red lead." Wainwright's method as described in the 1910 and 1916 editions of "Stillman's Engineering Chemistry" was used, but on account of the necessity of boiling and cooling the solns. and as the titer of the  $\text{SnCl}_2$  must be found under identical conditions, the method was found objectionable. A modification is given which was found to give highly accurate results. Moisten 0.5 g. red lead with water and triturate till all is very finely divided (the condition for success), add 25 cc. 0.1 *N*  $\text{SnCl}_2$  and stir, add 25 cc. concd.  $\text{HCl}$  and stir till all but some white particles is dissolved, then titrate with 0.1 *N*  $\text{I}$ . The end reaction is sharp. The method also works well on lead peroxide, since it only requires double the quantity of  $\text{SnCl}_2$  and  $\text{HCl}$ .

J. E. CLARK.

**Constituents of resins.** II. Constituents of Sumatra gum benzoin. HANS LIEB AND ALOIS ZINKE. *Monatsh.* 39, 219-30(1918); *J. Chem. Soc.* 114, I, 502-3; cf. C. A. 13, 79.—Unlike Siamese gum benzoin, Sumatra gum benzoin dissolves completely in hot dil. aq.  $\text{NaOH}$ ; the resulting soln., on boiling, deposits the sodium salt of 1-benzoresinol, m. 339-41°,  $[\alpha]_D^{25} -12.88^\circ$ , probably of the compn.  $\text{C}_{20}\text{H}_{24}\text{O}_4$ . The mother liquors on the addition of a little  $\text{Et}_2\text{O}$  deposits the sodium salt of d-sumaresinol, needles with 4 mols.  $\text{H}_2\text{O}$ ,  $\text{C}_{20}\text{H}_{28}\text{O}_4 \cdot 4\text{H}_2\text{O}$ , m. 298-9°,  $[\alpha]_D^{25} 51.6^\circ$ . Methyl ether, crystals, m. 215-6°; ethyl ether, needles, m. 207-8°. It is isomeric with siarresinol. The benzoresinol of Ludy was probably a mixt. of d-sumaresinol with l-benzoresinol. C. J. WEST.

**Melting point of rosin.** T. L. CROSSLEY. *J. Ind. Eng. Chem.* 11, 52-3(1919).—Rosin has no definite m. p. and the results obtained, which vary with the method used, are tabulated for the capillary method and for the "column" method, using 3 different heights of a rosin column inside of a glass tube of small diameter with the bottom of the tube 1 inch below the surface of the  $\text{H}_2\text{O}$ . The most rapid detn. is by the "column" method, using a very thin film of rosin over the end of the tube, and these results are practically the same as those obtained by the capillary method. Cf. C. A. 6, 545.

F. A. WERTZ.

**Ester gums or artificial resin esters.** C. ELLIS AND L. RABINOVITZ. *J. Ind. Eng. Chem.* 8, 406-11(1916).—Rosin and other cheap, high-acid resins are too soft

for use in high-grade varnishes, and cause "livering" when used in grinding vehicles with certain pigments. E. and R. review the explanations given for this thickening effect. The neutralization of such resins improves them, but even rosin hardened by partial neutralization with  $\text{CaO}$ ,  $\text{ZnO}$ , etc., is not suitable for making grinding varnishes, and if too much of the oxides has been added the product becomes insol. in varnish solvents. To prep. esters of the soft resins, the softer constituents are removed by distn. or by leaching, and the residue then heated with equiv. wts. of glycerol, phenol, naphthol or carbohydrates at a high temp. with or without pressure. The patent literature on this subject is reviewed. Expts. on ester formation showed that a partial combination of rosin and glycerol took place when gases were bubbled through a mixt. of the two constituents at  $280\text{--}300^\circ$ , but the ester was usually soft and dark with an acid no. of 30 to 40, and considerable glycerol was volatilized. Mechanical stirring effected better esterification but the product was still dark in color. Various catalysts did not materially aid the process. The time, temp., and acid no. of the product from a number of runs are tabulated. Under ordinary conditions,  $\text{EtOH}$ ,  $\text{C}_4\text{H}_9\text{OH}$ , cresols,  $\text{C}_6\text{H}_5\text{NH}_2$ , and  $\alpha$ - and  $\beta$ -naphthylamines, sugar, starch and glucose did not react with rosin, nor did pressure in the presence of dehydrating agents or of I give beneficial results. A light-colored ester is demanded by varnish mfrs. and since esters darken on oxidation, some expts. were made using inert gases in the esterifying kettle. Dark esters cannot be bleached with bone black, fuller's earth,  $\text{SO}_2$ , etc. Detn. of acid no. was made on 1 g. of ester dissolved in 25 cc.  $\text{C}_6\text{H}_6$  or  $\text{Et}_2\text{O}$  and titrating with 0.1 *N* alc. KOH. What appears to be rosin acid anhydride is obtained by passing inert gases through rosin at  $300^\circ$ ; it differs from rosin in that when dissolved in  $\text{C}_6\text{H}_6$  or  $\text{Et}_2\text{O}$  and shaken with aq. alkali, it remains unaffected or reacts but slowly. This gives a rough method for detg. the anhydride content of rosin. The anhydride, however, even though it appears less reactive with alkali produces "livering" when mixed with basic pigments. A good rosin-glycerol ester should be light amber in color, contain no excess glycerol, dissolve readily in  $\text{C}_6\text{H}_6$  or turpentine to a soln. that remains clear, be practically insol. in 80%  $\text{EtOH}$ , and be practically unaffected by 10%  $\text{Na}_2\text{CO}_3$ . Copals are esterified with far more difficulty than rosin; they should first be cracked (heated). Damar, pontianak and congo esterify with glycerol to a certain extent. [Editor's note.—Through an error this paper was not abstracted back in 1916 when it appeared and the omission has just been discovered.] F. A. WERTZ.

Essential oil of *Pinus thumbergii* Parl. (SHINOZAKI) 17. Dyes suitable for the manufacture of pigments (Ger. pats. 296,991, 297,414) 25.

**Pigments.** A.-S. TITAN CO. Dan. 23,266, July 15, 1918. Substances contg. Ti-O compds. in amorphous form are heated until crystn. is effected.

**Titanium pigments.** A.-S. TITAN CO. Dan. 23,199, July 1, 1918. The Ti-O compds. are heated until the Ti compds. are converted into a fine cryst. form with increased covering power. Ti white is specified as suitable for the purpose.

**Painter's oil.** O. T. KRONSTAD. Norw. 28,678, Mar. 25, 1918. An oil for use in painting is composed of resin 35, whale oil 13, wood alc. or turpentine 46, litharge 3, and Cu fume 3.

## 27. FATS, FATTY OILS AND SOAPS.

H. SCHERUBEL.

The negative catalysis of the hydrogenation of oils. S. UENO. *Kogyō-Kwagaku-Zasshi* (*J. Chem. Ind. Japan*) 21, 898-939(1918).—The ratio number  $\gamma$  is defined as

$\gamma = (x - y)/x$ , where  $x$  and  $y$  are the I value after and before the hydrogenation of an oil. In the present investigation, the author compared the ratio numbers in the hydrogenation of soy bean and a fish oil by the Ni catalyzer with and without adding metallic soap, Ni salts, metallic oxides and other substances under the same exptl. conditions. The following substances retard the catalytic action of Ni: soaps of K, Na, Li, Mg, Ba, Be, Fe, Cr, Zn, Cd, Pb, Hg, Bi, Sn, Ur, Au;  $\text{Cu}(\text{OH})_2$ ,  $\text{Al}_2\text{SiO}_4$ ,  $(\text{NH}_4)_2\text{MoO}_4 \cdot \text{H}_2\text{O}$ ,  $\text{H}_2\text{BO}_3$ ,  $\text{As}_2\text{O}_3$ ; HCl, KOH; glycolic, lactic, hexahydroxystearic, oxalic, succinic, fumaric, malic, tartaric, citric acids; metallic Zn, Fe, Pb, Hg; S, Se, Te, P; protein, blood albumin, fibrin, gelatin, glycerol, lecithin, sucrose, glucose, mannitol, amylum; antipyrine, morphine, strychnine; KCN, amygdalin. S. KOMATSU.

The velocity of the hydrogenation of oils. S. UENO. *Kōgyō-Kwagaku-Zasshi* (J. Chem. Ind. Japan) 21, 749-62 (1918).—Soy bean, camellia and sardine oils were used in this study. The velocity of the hydrogenation of the oils with Ni catalyzer mixed with kieselguhr in the proportion of 1:3 at the definite temp. between 100-160°, was studied by determining from time to time the I value of the oils. The velocity of the reaction observed obeys the law of monomolecular reaction. S. KOMATSU.

The seed oil of *Amorpha fruticosa*. H. NAKATOGAWA. *Kōgyō-Kwagaku-Zasshi* (J. Chem. Ind.) 21, 781-2 (1918); cf. Shinozaki and Hoshino, C. A. 13, 361.—The seed oil of the plant grown in Manchuria is a brownish yellow substance,  $d_{20}^{20}$  0.9426,  $n_D^{20}$  1.4845, acid value 7.06, sapon. value 182.5, iodine value 133.71, butyrefractometer (20°) 80.8°. The yield is 8%. S. KOMATSU.

Neutralizing acid fats and oils. H. SCHLINCK. Dan. 23,298, July 29, 1918. Fatty acids are converted into esters with glycerol, glycol, etc., with the aid of a catalyzer such as naphtholsulfonic acid. To prevent increase of viscosity in the product, an indifferent substance in powder form is added. Cf. also 23,297, July 29, 1918, according to which the fats and oils are heated with glycol alone.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Determination of water in molasses and other sugar-factory products by the distillation method. T. VAN DER LINDEN, M. KAUFFMAN AND F. LEISTRA. *Arch. Suikerind.* 25, 951-62 (1917); *Analyst* 43, 221.—The direct detn. of the water in cane molasses by distn. with xylene gives very satisfactory results, provided a certain rate of distn. is observed; if heating be prolonged, some decompn. of the product with the formation of water occurs. It is necessary to make a "meniscus correction" in measuring the vol. of water passing over (this amts. to 0.16 cc. under the conditions obtaining, xylene and not air being above), and also a correction for loss of water, either by volatilization or absorption by the liquid distd. (for the app. used this was found to be 0.3 cc.). Place 50 g. of the sample molasses or other product with 350 cc. of xylene in a Cu distn. flask connected with an upright condenser, the lower end of which discharges into a 250-cc. measuring cylinder graduated to  $\frac{1}{10}$  cc. So regulate the heat that about 100 cc. of distillate passes over in  $\frac{3}{4}$  of an hr.; after this accelerate the distn. so that in the fourth quarter of an hr. another 100 cc. distills over; remove the receiver immediately when 200 cc. have been collected. Other volatile immiscible liquids, benzene, toluene, kerosene, and mixts. of these, gave less satisfactory results.

E. H.

New Baumé scale for sugar solutions. FREDERICK J. BATES AND H. W. BEACHE. Bur. Standards, *Tech. Paper* No. 115, 1918.—There are three Baumé scales at present



in use in the U. S., all being related to sp. gr. by the equation  $d = m - (m/s)$ , where  $d$  is the Baumé degrees,  $s$  the sp. gr., and  $m$  a const. modulus. The new scale, or American scale, has a modulus of 145 and is based on a temp. of 60° F. The Gerlach scale has a modulus of 146.78 and a temp. of 17.5° C. The "old" or Holland scale has a modulus of 144. The latter two are used in the sugar industry. The American scale is used extensively in the acid industry. This new American Baumé scale has three features which should recommend it for use in the sugar industry: (1) It is based upon the sp. gr. values of Plato which are considered the most reliable. (2) It is based on 20° C, the most convenient and widely accepted temp. for sugar work. (3) It is based on the modulus 145, which has already been accepted by the Mfg. Chemists Association, by the Bureau of Standards, and all American mfrs. of hydrometers. An extensive table is given showing the relation between degrees Brix,  $d_{20}^{20}$ ,  $d_{20}^{20}$ , degrees Baumé (modulus 145). J. K. DALE.

The seeding method of graining sugar. H. E. ZITKOWSKI. *J. Ind. Eng. Chem.* 10, 992-4 (1918).—See C. A. 12, 1842. J. K. DALE.

Study of dextrin. M. YANO. *Kōgyō-Kwagaku-Zasshi (J. Chem. Ind.)* 21, 865-81 (1918).—Sweet-potato starch produced in Japan was employed in this study of the prepn. of dextrin. Hydrolysis by  $\text{HNO}_3$ , gave better results than by  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$  or  $\text{AcOH}$ . Make a paste of 10 parts of 0.5%  $\text{HNO}_3$  and 100 parts starch, dry at about 50° and then heat in a lacquered Zn pan at 150° for 1 hr. The dextrin thus obtained can be used as a substitute for gum arabic in 50-60% soln. S. KOMATSU.

Determination of aldehyde sugars (COLIN, LIEVIN) 7. Determination of reducing sugars (CLARK) 7.

Filtering sugar liquors. G. W. S. SIMPSON and R. F. LYLE. *Brit.* 120,055, July 24, 1917. Sugar liquors are purified prior to decolorization by charcoal by filtration through layers of sphagnum or leucobryum which has been dried, disintegrated, and cleaned by being boiled with alkali, such as  $\text{NaOH}$  or  $\text{Na}_2\text{CO}_3$ . The moss is packed between permeable retaining walls which may be covered by a cloth to retain coarse impurities. The cloth may be removed and washed without disturbing the moss. The moss may be cleaned by passing hot  $\text{H}_2\text{O}$  through the filter by or mixing the moss with  $\text{H}_2\text{O}$ . The filter may be in the form of a bed between horizontal partitions in a tank or may be in the form of a leaf filter or in the form of a rotary filter in which case the cloth covering is in the form of an endless band which travels through a washing trough and between  $\text{H}_2\text{O}$  sprays. Further details are specified.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

Leather, etc., substitutes (Brit. pat. 119,902) 30. Vegetable dyestuff and tannic acid (Jap. pat. 32,458) 25.

Substitute for leather. A. MEIER and H. RALL. U. S. 1,287,387, Dec. 10. A substitute for leather adapted for various purposes is formed by treating material such as albumins spread upon tissues first with a mineral tanning substance such as a Cr salt soln. and then with a soln. of  $\text{CH}_2\text{O}$ . Bacteria, yeast, glue or other sources of albumin may be employed.

Drying patent leather by ultraviolet rays. C. HEYL. *Swed.* 43,847, Apr. 3, 1918. Rays are employed which do not lead to the formation of ozone.

**Tanning.** C. BLANC. Brit. 120,049, Oct. 17, 1918. Chromic liquors for tanning are prepd. by reducing chromic acid, in an acid hydrolyzing medium, by cellulose or lignocellulose materials in a divided state. Three examples are given, in one of which the cellulose is mixed with the hydrolyzing acid such as  $H_2SO_4$  or  $HCl$  some hrs. before addition of the dichromate. Cellulose materials mentioned are sawdust; cotton, straw, and paper waste; spent tan; wood fibers; forage and cakes of inferior qualities; brewery residue; olive husks deprived of oil; and beet-root pulp.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

**Influence of heavy tapping on the latex and rubber.** O. DE VRIES. *Med. Centraal Rubberstation* 1918, No. 9, 439-55.—Two series were run, on groups of 150 trees each, tapping with two left-hand cuts for  $\frac{1}{2}$  and  $\frac{3}{4}$  of the circumference. The principle changes were: the rubber content of the undiluted latex decreased from 45 to 17%; the sp. gr. rose from 0.966 to 0.998; tensile strength remained constant; rate of vulcanization decreased from 170 to 105 min.; viscosity decreased at first from 1.70 to 1.48, afterwards rising to 1.60. The trees tapped for  $\frac{3}{4}$  of their circumference showed more rapid changes, reaching the max. values before the other group. The continuation of these expts. was prevented by causes which permitted the trees to rest, such as seasonal decrease in latex; interruptions in tapping by rains; and shallow tapping by change in workmen.

JOHN B. TUTTLE.

**The nature of the vulcanization process.** G. VAN ITERSOM. Delft. *Intern. Assoc. for Rubber Cultivation in Netherland Indies Comm. of Netherland Govt. Inst. for Advising Rubber Trade and Ind.* Pt. 7, 239-61(1918).—I. bases his argument on the following established facts: (a) the process is additive; (b) the S is transferred into the combined state; (c) the "binding" is complete; (d) small quantities of S produce important changes in crude rubber; (e) the change in the properties of rubber during vulcanization is continuous; (f) the velocity of combining has a temp. coeff. situated between 2 and 3; (g) the velocity is strongly influenced by catalysts, acids retarding and alkalis in weak concn. accelerating; (i) first latex plantation rubbers, vulcanized under constant conditions produce mechanical properties which strongly correlate with the vulcanization coeff. (this does not follow with accelerated vulcanization); (j) continued mechanical treatment changes the mechanical properties but not the vulcanization coeff. After reviewing the work of Weber, Spence and Young, Hinrichsen and Kindscher, Skellon and Van Heurn, I. concludes that the amt. of S which can unite with rubber is greater than the 32% limit advocated by Weber and others. S on heating is transferred into other modifications, and the latter induce combination. I. assumes this combination to be colloidal, to which no objection can be raised on account of the continued combination at normal temp. if the change is understood to reach an equil. In this case, the modified S is constantly being eliminated by combination with the rubber. The assumption of colloidal combination would be sufficient to explain why small quantities of S produce such marked effects on the properties of rubber, as well as the continuity of the changes on continued vulcanization. I. then proposes two hypotheses to explain the known facts: (1) The colloidal S would unite to one complex with the rubber during vulcanization, this complex being insol. in the ordinary solvents for rubber. This change in S may be expressed as  $S_\lambda \rightleftharpoons S_\mu$ . As the  $S_\mu$  combines with rubber the medium in which the change from  $S_\lambda$  to  $S_\mu$  takes place changes and hence the increased velocity of the reaction through change in equil. The second hypothesis is that an active modification of S exists and that it combines chemically with a part of the rub-

ber to form a compd. insol. in the usual solvents for rubber, and this compd. unites colloiddally with the remainder of the rubber to form an insol. complex. The velocity of this reaction can thus be detd. by the rate of transformation of the original S into the active form, or by the rate of the chem. binding of the active S to the rubber. In this latter case, the chem. binding of the compd. with the remainder of the rubber would have to take place with a greater velocity than the chem. process. I. assumes therefore that catalysts act strongly on the reaction  $S_A \rightleftharpoons S_\mu$  to give a greater proportion of  $S_\mu$ . A rapid binding of S gives different mechanical properties than a slower reaction having an equal vulcanization coeff. This is probably due to the complex not having been exposed to heat for as long a period. Neither hypothesis limits the amt. of S which can combine with the rubber to 32%, and hence they do not conflict with the fact that percentages of combined S greater than 32% are obtained from mixts. rich in S which have been vulcanized for a long time. JOHN B. TUTTLE.

**The vulcanization of rubber at constant temperatures and by a series of increasing temperatures.** G. D. KRAITZ AND ARTHUR H. FLOWER. *J. Ind. Eng. Chem.* 11, 30-3(1919).—The authors show that at const. temp. S must be present in such an amt. that its active mass is not decreased during vulcanization to such an extent as to retard the reaction. For rubber-S mixts. containing less than 5% S better physical properties are obtained with a series of increasing temp. than with const. temp. They also claim that it is unwise to evaluate samples of vulcanized rubber solely upon their vulcanization coeff. JOHN B. TUTTLE.

**Aging of vulcanized plantation rubber.** HENRY P. STEVENS. *J. Soc. Chem. Ind.* 37, 305-67(1918).—A study of the change in vulcanization coeff., breaking strain and elongation of ordinary plantation sheet and unrolled sheet rubber, when subjected to normal aging over a period of 120 weeks. Coeffs. higher than 3.2 show increasingly rapid deterioration with increase in coeff. JOHN B. TUTTLE.

**Porosity of vulcanized rubber.** G. VAN ITERSOM. *Intern. Assoc. for Rubber Cultivation in Netherland Indies, Comm. of Netherland Govt. Inst. for Advising Rubber Trade and Ind.* Pt. 7, 223-37(1918).—Two types of porosity are described: Surface porosity is caused by condensation of water vapor on the surface during vulcanization. It may be obviated by wrapping to prevent contact, such as with wet clothes, tin foil, etc. Interior porosity is caused by lack of sufficient pressure to prevent expansion of air and water contained in rubber compd. or by too rapid release of steam pressure with under-vulcanized samples where the strength of the rubber is not sufficient to prevent permanent deformation. It is necessary to have sufficient counter pressure to resist air and water vapor expansion, and raise and lower temp. gradually, especially with under-vulcanized rubber goods. JOHN B. TUTTLE.

**Influence of heat on the inner qualities of rubber.** O. DE VRIES AND H. J. HELLENDOORN. *Med. Centraal Rubberstation* 1918, No. 10, 539-60.—Three series of tests were made to show the influence of heat: (a) on the latex; (b) on the wet coagulum; and (c) on dry rubber. Series "a" showed considerable increase in the rate of vulcanization (sometimes 100%), lower viscosity, with no change in tensile strength or slope of curve. Under series "b" soaking the freshly rolled crepe or sheet in hot water shows little effect at 40°, but at higher temp., especially at 60-70°, was very injurious. The rate of vulcanization, viscosity and tensile strength decreased. Heating the coagulum during rolling was injurious but not to the same extent as the soaking in hot water. Drying the rolled coagulum at higher temp. showed no effect at 40°, but at 60° the rate of vulcanization and viscosity decreased. Series "c" shows no change in the rate of vulcanization, but the viscosity and tensile strength are lower. The effect is quite marked at 85° or over, owing to oxidation, especially with free access to the air. JOHN B. TUTTLE.

**Influence of rustiness on the inner qualities of sheet rubber.** O. DE VRIES AND H. J. HELLENDORF. *Med. Centraal Rubberstation* 1918, No. 10, 529-38.—Hellen-dorf has shown (to be published later) that rustiness is caused by aerobic organisms presumably related to those which form dextrin and similar substances from sugars. This film is a jelly-like substance produced from the serum by the action of these organisms. Rapid surface drying is said to be the best means of preventing rustiness. The authors show that rustiness causes no appreciable change in tensile strength, but hastens vulcanization and increases the viscosity.

JOHN B. TUTTLE.

**The viscosity of plantation rubber, its relation to the properties after vulcanization, and its significance in rubber testing.** O. DE VRIES. *Med. Centraal Rubberstation* 1918, No. 9, 456-86.—de Vries expresses his results as the index of viscosity, *i. e.*, the logarithm of relative viscosity for a soln. of 1 g. rubber in 100 cc. benzene. He claims that there is no relation between viscosity and tensile strength. Several factors cause a decrease in both: (1) heat, (2) salts and alum, (3) organisms attacking the rubber [a separate article by de Vries and Hellen-dorf (cf. preceding abstr.) states that "rustiness" causes no change in tensile strength although influencing the viscosity.—ABSTR.]; (4) rubber from young trees. Many factors cause the viscosity and rate of vulcanization to change at the same time; basic substances increasing both and acid substances the reverse. de Vries was unable to find any relationship between viscosity and the slope (*i. e.*, the resistance to stretching, or the elongation curve). Three groups of factors are recognized. (1) Those changing the state of aggregation. The viscosity is affected but the properties after vulcanization are not. (2) Chemicals used in the prepn. of the crude rubber change the viscosity and rate of cure but do not affect the tensile strength. (3) Factors which cause decompn. or oxidation lower the viscosity and tensile strength.

JOHN B. TUTTLE.

**The determination of free carbon in rubber goods.** A. H. SMITH AND S. W. EPSTEIN. *J. Ind. Eng. Chem.* 11, 33-6(1919).—This method consists essentially in removing by soln. such constituents as may be decomposed or volatilized by heat, using concd.  $\text{HNO}_3$  to form acetone-sol. deriv. of rubber, and igniting the residue. The loss on ignition is assumed to be free C; it is usually about 105% of the amt. present. Corrected by this factor the results are sufficiently accurate for com. work.

JOHN B. TUTTLE.

**Apparatus for vulcanizing rubber articles.** W. C. MERRILL. U. S. 1,287,071, Dec. 10.

**Leather, etc., substitutes.** J. L. WATKINS. Brit. 119,902, Oct. 16, 1917. In the manuf. of rubber substitutes of the kind containing scrap and new rubber, scrap leather, and a cotton or other vegetable fiber, together with kapok, the leather and old rubber are pulverized with the new rubber, asbestos is added in powdered or fibrous form, and the whole is mixed with oil and kapok fiber. There may also be added either or both a jute fiber and a silk fiber and a metallic oxide, as well as a vulcanizing agent such as NaOH or S. The dough-like mixt. is rolled into sheets or bars and vulcanized; it may include a coloring agent, and also for the purpose of making a heavy material, crushed slate or cement. Proportions are given for a typical mixt.

# CHEMICAL ABSTRACTS

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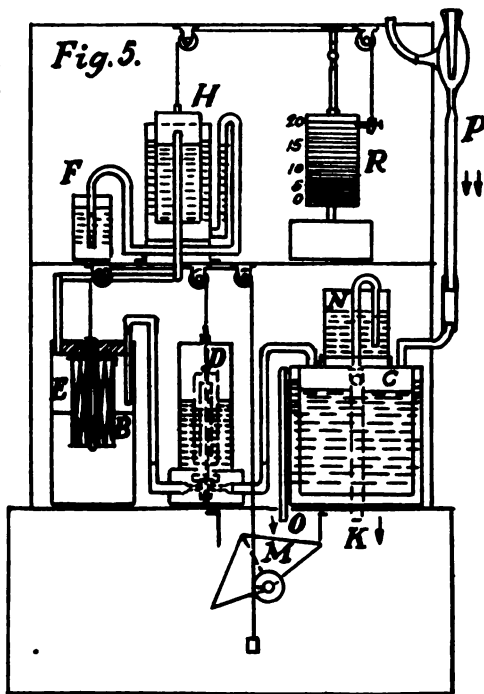
No. 5

## I. APPARATUS.

L. C. JONES.

**Simplified gas analyses.** J. J. R. MACLEOD. Toronto. *J. Lab. Clin. Med.* 4, 69-72(1918); cf. *C. A.* 12, 2328.—For the purposes of teaching, the usual types of gas buret are unsuitable because of the care that has to be given them to prevent "freezing" of the stopcocks. An app. can be constructed by using screw clips in place of stopcocks, provided some means be taken to adjust the gas pressure in the buret after the screw clips have been tightened. This is accomplished by a device known as a pressure adjuster which is described and shown in diagram. G. T. CALDWELL.

**Carbon dioxide recording apparatus.** NAITO. *Engineering* 106, 515(1918).—"The author explains that the principle of  $\text{CO}_2$  recording is to relate temp. in a furnace with the ratio of  $\text{CO}_2$  in the flue to vol. of air supplied; excess of air obviously lowers the temp. and hence as long as sufficient air is available, the higher the temp. the higher the % of  $\text{CO}_2$ . He criticizes existing app., and proposes one as shown in the fig.  $P$  is a  $\text{H}_2\text{O}$ -jet pump supplied with acidulated  $\text{H}_2\text{O}$ ; it sucks the gas from the flue and passes it into the reservoir  $C$ , where the gas collects at the top. Between  $C$  and the absorbing bottle  $E$  is a valve  $D$ . The absorbing element, placed in the lower division of  $E$ , consists of an alkali soln., and into this soln.  $B$ , through its connection with the valve  $D$ , descends when  $D$  is opened.  $B$  is built up of thin strips of material non-corrosive to alkali, bound together at top and bottom. With valve open, and  $B$  in its lowest position, immersed in the alkali soln., this soln. is shut off from the gas, the bottle being closed by the upper rim of  $B$ . In this position the gas passes through  $E$  without contact with the alkali and lifts the holder  $H$  until excess bubbles out at  $F$ ; the rise of  $H$  measures quantity. Valve  $D$  is then closed,  $B$  being raised simultaneously so as to open the bottle of alkali soln.; the latter absorbs the  $\text{CO}_2$ ,  $H$  falling by the amt. of the absorption. The ratio of the fall of  $H$  to its original height gives the %."



A convenient and efficient digestion apparatus for the determination of crude fiber. HOWELL D. SPEARS. *J. Ind. Eng. Chem.* 11, 140-1(1919); illus. E. J. C.

An efficient laboratory funnel for filtering neutral liquids, especially the volatile organic solvents. T. B. ALDRICH. *J. Ind. Eng. Chem.* 11, 139-40(1919); illus. E. J. C.

A drying apparatus. C. J. VAN NIEUWENBURG. *Chem. Weekblad* 15, 1548-9 (1918).—A cast iron receptacle is made to receive a 250-cc. beaker, which rests on its flange in the opening, the inside diam. of which is not more than 2 mm. greater than the outside diam. of the beaker. The receptacle has 2 side arms, which are heated with Teclu burners. The evapn. proceeds rapidly, and the loss by spattering even from the open beaker is within the limits of exptl. error. JULIAN F. SMITH.

Washing in filter presses. D. R. SPERRY. *Chem. Met. Eng.* 19, 680-2(1918); cf. *C. A.* 12, 1847.—An elementary description of chamber presses equipped for "through" or "thorough" washing. W. L. BADGER.

Briqueting machines. T. GILMORE. *Can.* 188,436, Jan. 28, 1919. Structural features of a machine for briqueting preferably metal or mineral fines without the use of a binder.

Material conveyors for furnaces. T. B. CRAM. *Can.* 188,373, Jan. 21, 1919. Structure.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

Relationships in chemistry. J. W. BECKMAN. *J. Ind. Eng. Chem.* 11, 145-6 (1919).—The relationships discussed in this address have to do with the attitude towards each other of the so-called inside chemist or university man and the outside chemist or industrial man. E. J. C.

The Research Division, Chemical Warfare Service, U. S. A. GEO. A. BURRELL. *J. Ind. Eng. Chem.* 11, 93-104(1919).—An interesting story of the organization, personnel and work of this division. E. J. C.

The training of the chemist. EDWARD ELLERY. *J. Ind. Eng. Chem.* 11, 166-7 (1919); cf. *Church, C. A.* 13, 165. E. J. C.

Is high-school chemistry a vocational subject? HANOR A. WEBB. *School and Society* 8, 672-5(1918); cf. *C. A.* 13, 87. E. H.

Outline of a scheme of laboratory design. ANON. *Chem. Trade J.* 64, 5(1919).—A plan for an industrial lab. is discussed. E. H.

India and the chemist. ANON. *Chem. Trade J.* 64, 3-4(1919). E. H.

The Grassell medal. *J. Ind. Eng. Chem.* 11, 162(1919).—The Grasselli Chemical Co., of Cleveland, O., has announced its intention to found a medal to be awarded by the New York Section of the Soc. of Chem. Ind. The rules for the award are given. E. J. C.

The distribution of errors in the determination of atomic weights. P. A. GUYE AND T. RENARD. *Arch. sci. phys. nat.* 44, 402-3(1918).—This note is a brief discussion of the disagreement between errors of the detns. of at. wts. on the av. and the laws of calcg. probabilities. The large errors are numerous as compared with smaller ones even in the three methods of detn. employed (cf. *C. A.* 12, 2467). The calcn. of the probable error seems to have no real significance since the error may be abs. with reference to the av., depending upon the measure of precision; algebraic, depending upon

the dissymmetry of observations; or quadratic, depending upon their dispersion. It is an open question, therefore, whether the no. of detns. has been too small to permit application of probability laws, or whether these detns. conceal a cause of error which has escaped investigators.

G. L. CLARK.

**Density, compressibility and atomic weight of argon.** A. LEDUC. *Compt. rend.* 167, 70-1 (1918).—Argon which contd. about 5% impurities (chiefly O and N) was prepd. by fractional distns. over coconut charcoal. The gas was then allowed to flow many times from one flask to another through a red-hot tube containing shavings of Ca and CuO to remove the O and N. The CuO serves to destroy hydrocarbons, etc., evolved by the Ca. Finally the gas was passed over KOH and P<sub>2</sub>O<sub>5</sub> and these operations were repeated until no change in density resulted from them. Detd. by the method described in connection with the at. wt. of Ne (C. A. 8, 2831), the limiting d. was 1.3787; the difference between this and the 1.379 of Ramsay is not guaranteed. The mean coeff. of deviation from Mariott's law at 14° is  $10.2 \times 10^{-8}$  per cm. of Hg. If A is to be included in L.'s series of normal gases this coeff. should be  $8.5 \times 10^{-8}$ , or in applying his formulas the crit. pressure should be taken as 40 atm. in place of 48 atm. The mol. vol. of A relative to that of a perfect gas is 0.9990; the same ratio for O is 0.9992. Hence the at. wt. of A is  $32 \times (9990/9992) (1.3787/1.1053) = 39.91$ . There is perhaps some uncertainty as to the second place of decimals. (Details of the expts., individual detns. from which means were derived, etc., are not given.—ABSTR.)

E. B. MILLARD.

**Melting points of chemical elements, and other standard temperatures.** Bur. of Standards, *Circ.* 35, 3rd edition, revized July 15, 1918.—The other standard temps. given are the boiling points of O (−183.0°), H<sub>2</sub>O, naphthalene (217.96°), benzophenone (305.9°) and S (444.6°), the sublimation point of CO<sub>2</sub> (−78.5°), the point of transformation of Na<sub>2</sub>SO<sub>4</sub>·10H<sub>2</sub>O into Na<sub>2</sub>SO<sub>4</sub> (32.384°), the eutectic freezing point of 3Ag<sub>2</sub>Cu (779°) and the f. p. of NaCl (801°).

E. J. C.

**Simple device for illustrating molecular motion.** E. R. STOKKLE. *Science* 48, 474-6 (1918).—If finely powdered glass or some similar substance is placed on the surface of Hg in an evacuated glass tube, and the Hg then slowly heated, the particles of glass will display motions corresponding to those of the Hg mols.

F. C. HOYT.

**The determination of the compressibility of solids at high pressures.** LEASON H. ADAMS, ERSKINE D. WILLIAMSON AND JOHN JOHNSTON. *Geophysical Lab., Wash., D. C. J. Am. Chem. Soc.* 41, 12-42 (1919).—A method is described for measuring the compressibility of solids under hydrostatic pressure, and results are presented for 16 materials at pressures up to 12000 megabars. The  $P-\Delta v$  graph for Au, Cu, brass, Ag, Al, and calcite, like that of steel, is linear; but for Zn, Sn, Cd, Pb, Sn-Bi alloy, quartz, Bi and NaCl, the graph shows an appreciable curvature, thus indicating a decrease of compressibility with increasing pressure. A comparison was made of the compressibility of two alloys with that of their components. In the case of a simple mixt., such as the Sn-Bi alloy, the measurements indicate that the compressibility of mixts. whose other properties, such as sp. vol., elec. cond., and sp. heat, are approx. linear functions of the compn., is related in the same simple way to the compressibilities of the separate components. However, the compressibility of alloys of the class to which brass belongs is much lower than the sum of the individual compressibilities.

R. H. LOMBARD.

**Compressibility of aqueous solutions, especially of urethan, and the polymerization of water.** THEODORE W. RICHARDS AND SVEN PALITZSCH. *Harvard Univ. J. Am. Chem. Soc.* 41, 59-69 (1919).—The compressibilities of aq. solns. of urethan were measured at 20.00° over a pressure range from 100 to 300 megabars. A minimum

occurs with the soln. containing 24 g. urethan to 100 g.  $H_2O$ . Surface tension, viscosity, and specific vol. are also measured, but display no minimum. These results are shown to be in accord with the theory which regards  $H_2O$  as a mixt. of mono-, di- and tri-hydrol.

F. C. HOYT.

The miscibility of phenol and aqueous solutions of alkalis. RENÉ DUBRISAY, TRIPIER AND TOQUET. *Compt. rend.* 167, 1036-8(1918).—To det. the soly. of phenol, a known amt. of phenol is mixed with a definite quantity of an aq. soln. of NaOH of known strength and the mixt. heated till complete soln. has taken place. The soln. is then allowed to cool with stirring and the temp. at which turbidity appears is recorded. In the same way, the soly. of phenol in aq. soln. of various bases, acids, and salts was detd. The results are exactly what might be predicted. When the phenol is dissolved in water, the temp. at which the turbidity appears is higher than when the phenol is dissolved in aq. NaOH or alk. earth hydroxides and is lower than when it is dissolved in aq. NaCl,  $Na_2SO_4$ , HCl,  $H_2SO_4$  or  $Na_2CO_3$ .

ROGER ADAMS.

Chemical reactions at low pressures. IV. The clean-up of nitrogen by a heated molybdenum filament. IRVING LANGMUIR. *J. Am. Chem. Soc.* 41, 167-94(1919).—The possibility that a Mo filament heated in a fairly high vacuum (0.03 mm. and less) to a temp. at which vaporization occurs (2000-2400 K.) may clean-up  $N_2$  more efficiently than W, since it evaps. more rapidly, is not realized exptly. The rate of evapn. was found to be the same as in vacuum; hence  $N_2$  does not attack the Mo filaments. Denoting by  $\epsilon$  the ratio of the number of mols. of  $N_2$  cleaned up to the number of atoms of Mo evapg. in the same time, the following exptl. facts are outstanding:  $\epsilon$  is always less than 1, is independent of pressure and decreases as bulb and filament temp. is raised. The highest values were about 0.4 and the lowest 0.01. There is no clean-up in the presence of any  $H_2O$  vapor, as is true with CO instead of  $N_2$ , where  $\epsilon$  is unity. The author presents a theory of the mechanism of the clean-up from the observed facts to the effect that Mo atoms and  $N_2$  mols. combine to form at least 2 products: the very stable NMoN from the colliding mols. of low relative translational velocity and high rotational velocity of the  $N_2$  mols.; and the secondary compd.  $Mo:N_2$  which decomposes on striking the bulb because of the greater attraction of the Mo atoms for each other. This theory is used to account for the nature of the metallic deposit, its spongy character, the loss of only part of the  $N_2$  from it, which is not entirely reabsorbed, the absorption of  $N_2$  but not  $H_2$  when cooled with liquid air, complete chem. combination with  $N_2$  at  $270^\circ$ , and extreme activity such that  $H_2O$  is decomposed at room temp.

G. L. CLARK.

Relations between distribution ratio, temperature, and concentration in the system: water, ether, succinic acid. GEO. S. FORBES AND ALBERT S. COOLIDGE. *J. Am. Chem. Soc.* 41, 150-67(1919).—This paper records an exhaustive study of the extent and causes of deviation from a constant usually assumed of the ratio of distribution of succinic acid between  $H_2O$  and  $Et_2O$ , with a view to deriving equations to show the actual behavior. The mutual soly. of the solvents, the change in compn. of each with concn. of dissolved acid, the electrolytic dissociation of acid in the  $H_2O$  layer, and very complex variations with temp. are recognized as the causes of the value of the ratio. Measurements are therefore given of the soly. of  $Et_2O$ ,  $H_2O$  and succinic acid in 2 and 3 component systems between  $15^\circ$  and  $25^\circ$ , and of the actual distribution ratio of the acid between the 2 solvents at various concns. and temps. The complete differential of the ratio with respect to temp. is derived, using a solid figure, as a function of 8 partials, 4 of temp. and 4 of soly., from the effects of temp. upon solubilities involved, with const. solvent compn., and from sep. effects of changing solvent at const. temp. such that  $dR/dT = 0.0257$ , agreeing closely with exptl. values.



With respect to variations with increasing concn. of dissolved acid, the ratio when calcd. upon a basis of unchanging solvents increases sharply even after correcting for dissociation of acid and association of  $H_2O$ . By means of the Rothmund mutual soly. equation it is shown to be probable that the av. state of association of  $H_2O$  dissolved in  $Et_2O$  is somewhat less than 2.

G. L. CLARK.

Heterogenous equilibria between aqueous and metallic solutions; the interaction of mixed salt solutions and liquid amalgams. V. A study of the ionization relations of potassium and strontium chlorides in mixtures. G. MCP. SMITH AND E. A. REES. Univ. Ill. *J. Am. Chem. Soc.* 40, 1802-47(1918).—The ionization relations of  $KCl$  and  $SrCl_2$  in soln. were studied by detg. the equil. distribution of  $K$  and  $Sr$  between mixed solns. of  $KCl$  and  $SrCl_2$ , and mixed dil. liquid amalgams containing  $K$  and  $Sr$ . In equiv. mixts. of  $KCl$  and  $SrCl_2$  the  $Sr^{++}$  fraction decreases, while the  $K^+$  fraction correspondingly increases, with increasing total salt concn. The ion fractions are not directly proportional to the mol. fractions of the salts. This fact is in accordance with Werner's conceptions concerning the formation and dissociation of higher order compds. The value of the "equil. expression,"  $C_c = (SrHg)(KH_2O)^2/(KHg)^2(SrH_2O)$ , increases directly with the concn. of the amalgam up to about 0.3 milli-equiv. of metal per 10 g. Hg. From a study of the interaction equil. between the mixed solns. and amalgams, between  $15^\circ$  and  $40^\circ$ , the heats of different interactions were calcd. by the van't Hoff equation. The interaction heat increases gradually with decreasing total salt concn. In the case of both  $Sr$  and  $K$ , the free atomic concn. in the dil. equil. amalgam is directly proportional to the hydrargyride concn. in the sense of the equation  $Me + xHg = MeHg_x$ ; and the mass action expression  $(Me)/(MeHg_x) = K_M$ , holds for  $K$  and  $Sr$  hydrargyrides in the presence of one another at total concns. up to 2 milli-equiv. per 100 g. Hg. In mixed amalgams of  $K$  and  $Sr$ , when in equil. with a mixed soln. of fixed concn., the free atom fraction of  $Sr$  decreases, while that of  $K$  increases in proportion to the total concn. of the amalgam. This shows that the degree of dissociation of the  $Sr$  hydrargyride is much less than that of the  $K$  hydrargyride.

R. H. LOMBARD.

Affinity studies. XII. A thermodynamic relation between the mixing affinities in partly saturated solutions and its application for the determination of affinities. J. N. BRØNSTED. Kjøbenhavn, Denmark. *Kgl. Danske Videnskabernes Selskab. Matematisk-fysiske Meddelelser*. I, No. 5, 39 pp.(1918).—There is found in this paper a relation between the potentials of 2 components in a mixt. containing more than 2 components and in which the potentials of the other components are kept const., e. g., by having the solns. in question always satd. in these components. This relation is expressed by the equations  $x(dA/dx) + (1-x)(dA_1/dx) = 0$ , or  $n_1dA_1 + n_2dA_2 = 0$ , where  $A$  and  $A_1$  mean the differential, mol. mixing affinity of the components  $K$  and  $K_1$  and  $n_1, n_2$  the number of mol. in the mixt. These expressions have consequently the same form when the 2 components are present in a binary mixt. For the math. derivation of the formula see the original paper. The calcn. of the affinity of the reaction  $\alpha CaCl_2 \cdot 4H_2O$  to  $\beta CaCl_2 \cdot 4H_2O$  and the formation of carnallite and schönite from the cryst. compds. of these double salts is given. There is also described an exptl. method by which the vapor pressure and the concn. of the soln. can be detd. at the same time, and also by which can be found the points at which satn. occurs of 1 or 2 components. By means of this method the necessary data are found for the reaction  $KCl + NaClO_3 \rightleftharpoons KClO_3 + NaCl$  and  $KCl + NaNO_3 \rightleftharpoons KNO_3 + NaCl$  and the affinities are calcd. from the formula. The values, resp. 2020 cal. and 740 cal., check very well with those obtained from earlier measurements (C. A. 6, 1697) done in electrometric way, resp., 2070 cal. and 720 cal. This verifies the formula derived.

H. DEDICHEN.

**Silicate specific heats, 2nd series.** WALTER P. WHITE. Geophys. Lab., Washington. *Am. J. Sci.* 47, 1-43(1919).—The sp. heats of 19 substances, silica and silicates, cryst. and amorphous (glass), were detd. for upper temps. from 100° to 1400° (in some cases) by dropping from elec. or steam heaters into a water calorimeter at room temp., with methods that represented some improvement over those of C. A. 3, 2899; 5, 419, 420, 808. (a) Lack of uniformity of furnace temp. was regarded as the most serious source of error, and was quite satisfactorily overcome by using (1) a long furnace cavity (20 cm.  $\times$  4.8 cm. diam.), (2) Pt-faced shielding partitions, (3) winding concd. at the end, (4) a very fine thermoelement, inserted into the charge. Tests indicated at most only 0.2° difference between thermoelement and mean temp. of a charge 4.2  $\times$  6.0 cm. at 1100°, and several times this difference would not have been important. (b) The precision of the calorimeter was well in excess of requirements, thanks to a sensitive 24-couple thermoelement (C. A. 8, 3731, 3740), which nevertheless needed less care and precaution in use than less sensitive thermometers of most other kinds would have done. (c) Errors in dropping the hissing hot charges into the calorimeter water it was sought to eliminate by using as a tare the total effect on dropping the container alone, but the accidental irregularities, though seldom over 1 per mille, were disappointingly large, and by far the most prominent in the work. An unusual number of schemes were used for detecting "concealed," i. e., systematic or partly systematic errors, nearly always with negative results, and the conclusion is reached that in the original data, sp. heats over intervals from 0° and upward, "errors greater than 3 per mille are probably exceptional." Interval sp. heats alone are unsatisfactory; for getting from series of interval heats values of true sp. heat, two very accurate methods are given, which, however depend on having the original data evenly spaced along the temp. scale. The true heats obtained in this way necessarily have larger errors than the data from which they are derived. The values given in C. A. 3, 2899, do not differ over 5 per mille from the later ones. For some other substances and also for microcline, given as "orthoclase" in 1909, the mean atomic heats at different temps. are:

|                                     | 100°. | 300°. | 500°. | 700°. | 900°. | 1100°. |
|-------------------------------------|-------|-------|-------|-------|-------|--------|
| Silica glass.....                   | 4.05  | 4.95  | 5.35  | 5.58  | 5.75  | ....   |
| Quartz.....                         | 4.1   | 5.1   | 5.9   | 5.46  | 5.66  | ....   |
| Cristobalite.....                   | ....  | ....  | ....  | 5.55  | 5.67  | 5.77   |
| MgSiO <sub>3</sub> , amphibole..... | 4.42  | 5.26  | 5.62  | 5.87  | 6.04  | ....   |
| Albite.....                         | 4.28  | 5.10  | 5.46  | 5.71  | 5.91  | ....   |
| Microcline.....                     | 4.27  | 5.09  | 5.47  | 5.72  | 5.86  | ....   |
| Microcline vitrified.....           | 4.38  | 5.22  | 5.61  | 5.85  | 6.11  | ....   |
| Quartz at 550° is 6.3               |       |       |       |       |       |        |

Sp. heats can be obtained from these through division by: 20.1 for SiO<sub>2</sub>; 20.12 for MgSiO<sub>3</sub>; 20.33 for albite; 21.23 for microcline. Conclusions: (1) The low values of these at. heats, and their rapid increase, are a phenomenon mainly to be associated with the combined O the substances contain. (2) The heats of silica glass and cristobalite, compared with the latest formulas for at. heat, indicate that at. heats tend generally to increase at high temp. as they have been known to do more noticeably for metals. (3) The sp. heat on the amorphous form (glass) is nearly always from a few per mille to a few % above that of the crystal. (4) The at. heat of quartz for 300° below its inversion at 575°, though high, is not nearly high enough to account for the mechanical work done against cohesion in the anomalous expansion which takes place; the various phenomena over this extended temperature region thus have nearly all the characters of the changes of state which usually take place (when equil. is secured) at single temps. Moreover, the quartz inversion at 575° differs from most others, apparently, in that it does not consist in the growth of new crystals from

new nuclei, but in a springing of the whole crystal. Probably the same inversion occurs in a modified form in cristobalite also. Since quartz and cristobalite may change into one another by a very sluggish inversion we have two kinds of inversion, of independent and very different character, in the same compd. as also inferred by Fennel from the difference in promptness and amt. of change. Since Smits had held that the phenomena of cristobalite strongly confirmed the mix-crystal theory of allotropy (C. A. 5, 1861), it is pointed out that the difference in the character of the 2 kinds of inversion strongly discredits the application of the theory, which referred both to the same mechanism or cause. Other arguments for the theory are examd. and rejected. The peculiar inversion of  $\text{HgI}_2$  claimed by Smits, and apparently the best confirmation of the theory, H. E. Merwin and White, working together, were quite unable to repeat.

W. P. WHITE.

Specific heat determination at high temperatures. WALTER P. WHITE. Geophys. Lab., Washington. *Am. J. Sci.* 47, 44-59(1919).—Treats of exptl. methods and app. of previous paper (cf. preceding abstr.). Studies of behavior of calorimeter on exposure to air or to hot furnaces are briefly given. Time for reaching equil. in calorimeter or furnace was found greatly and often unaccountably different with different substances. The differences if neglected may cause serious error. The error in dropping and methods of diminishing it are discussed.

W. P. WHITE.

The thermal magnetic phenomenon. PIERRE WEISS AND AUGUSTE PICCARD. *Arch. sci. phys. nat.* 45, 329-35(1918).—See C. A. 12, 1144.

O. A. RANDOLPH.

Thomson effect in bismuth-tin alloys. A. E. CASWELL. *Phys. Rev.* 12, 231-7 (1918).—On the same metal specimens as were employed in the measurement of Peltier e. m. f. and thermo-elec. power (cf. C. A. 6, 452; 10, 997) the Thomson effect is detd. by a new compensation method between 2 bars of the same metal. With 2 bars of homogeneous material and uniform cross-section, a simple formula can be used, since, except in the case of those substances having abnormally high Thomson effects, the resistance of unit lengths of the bars and temp. gradients in them will be the same.  $\sigma = (2I - i)r / (2\pi I - i)t$ , where  $\sigma$  = abs. Thomson effect,  $I$  = current through generator,  $i$  = current through shunt resistance,  $r$  = resistance of bar,  $t$  = temp. gradient in degrees per unit length of bar, and  $\pi$  = fraction of proper compensation actually effected. The results obtained show a remarkable increase in the Thomson effect when very small amts. of Sn are added to pure Bi: e. g., 58 microvolts per degree C. for pure Bi and 676 for 1% Sn alloy. Beyond about 2% of Sn the value of the Thomson effect decreases.

G. L. CLARK.

Some problems of evaporation. H. JEFFREYS. *Phil. Mag.* 35, 270-80(1918).—A mathematical treatment of the problem of evapn. from which it is shown that when evapn. takes place in still air, the rate is proportional to the first power of the linear dimensions of the evapg. surface, but that when a steady current of air is passed, or is passing, the rate is proportional to the  $3/2$  power of the linear dimension. These results have both been confirmed in practice previously by other workers. A discussion follows of the rate of evapn. from leaves. Evapn. from a single cylindrical stoma is first considered, and it is shown that in many actual cases the total evapn. from a wet leaf would not be as much as that from the combined stomata in the leaf, supposing each stoma to evaporate according to the formula. It follows that evapn. from any stoma must be enormously restricted by the presence of other stomata in its immediate neighborhood.

S. C. LIND.

Two lecture experiments. FR. FICHTER. *Helvetica Chim. Acta* 1, 430-3(1918).—(1) *Avoiding the annoyance due to odor in collecting gases:* The app. was designed for  $\text{H}_2\text{O}$ -sol. gases that are first bubbled through  $\text{H}_2\text{O}$  till air-free and the delivery tube is

then introduced under Hg in the collecting tube. At the top of the collecting tube is sealed a T-tube with a stopcock, the latter between the T and the collecting tube. The stopcock being closed and the tube filled with Hg, one arm of the T-tube is connected to the gas evolution app. (e. g., HCl from NaCl and H<sub>2</sub>SO<sub>4</sub>) and the other arm to a flask of H<sub>2</sub>O. When the gas is being completely absorbed by the H<sub>2</sub>O (i. e., air-free), *slowly* open the stopcock so that the falling Hg column sucks in the gas; when the tube is filled with gas, close the cock and remove the burner. The pressure falls and air enters through the safety tube. (2) *Prepn. of CaC<sub>2</sub> without an electric furnace*: On a compressed layer of CO<sub>2</sub> snow in an Fe dish place powdered Ca (com. Ca coarsely ground in a mortar), mix with loose CO<sub>2</sub> snow, and throw upon the mass some burning metallic Ca (heated in the air). A crackling noise and the emission of sparks accompany the violent reaction, grayish yellow lumps resulting. Place a piece of the product and some H<sub>2</sub>O in a test tube provided with a stopper and delivery tube and ignite the evolved gas, noting the color of the flame which yields soot on cold porcelain. On removing the stopper note the odor of C<sub>2</sub>H<sub>2</sub> and NH<sub>3</sub> (test for latter with moist litmus paper). In order to suppress the formation of nitride, it is advantageous to use a large excess of CO<sub>2</sub> over that required for the equation  $2\text{CO}_2 + 5\text{Ca} = \text{CaC}_2 + 4\text{CaO}$ .

F. W. SMITHER.

Standardization of the Saybolt universal viscosimeter. W. H. HERSCHEL. *Bur. of Standards, Tech. Paper* 112 25 pp. (1918).—The standardization is along the lines of that of the Engler viscometer. The dimensions of four instruments are accurately measured, and appropriate tolerances assigned. The equation which gives the kinematical viscosity, which is the ratio of the abs. viscosity to the density, is  $\mu/\gamma = [k - (mv^2/g)] (\pi g d^4 t) / [128 Q (l + \lambda)]$ , where  $\mu$  is the viscosity in poises,  $\gamma$  the density,  $Q$  the vol. in cc. of the liquid flowing out in  $t$  seconds,  $\lambda$  the Couette correction which is added to the length of the tube to obtain the effective length,  $h$  the average head,  $m$  the coefficient of the kinetic energy correction,  $v$  the mean velocity in cm. per sec.,  $d$  the diameter, and  $l$  the length of the outlet tube. This may be written in the simplified form  $\mu/\gamma = At - B/t$ , where  $A$  and  $B$  are consts., depending on the instrument. By comparison of the times of flow for various liquids in the Saybolt instrument and in a standard Engler instrument the const.  $A$  is detd., and  $B$  is found from  $A$  and the calibration curve with water and alc. solns. By substitution of the dimensions in the complete equation the Couette and kinetic energy corrections are found. The former is 0.54  $d$ , and  $\mu/\gamma = 0.00220t - 1.80/t$ . Ubbelohde's method of obtaining the kinematic viscosity of abnormal instruments from the time of discharge for water is shown to be inaccurate. Conversion tables for Engler, Redwood and Saybolt viscometers are given.

F. C. HOYT.

Constitution of the nucleus and atmosphere of the sun. M. A. VERNONET. *Compt. rend.* 167, 722-5 (1918); cf. *C. A.* 12, 1144.—If the compn. at one point of the sun is known, that at any other may be calcd. by the method given in the previous paper. When the pressure is 1500 atm. the gas attains  $1/3$  of its limiting density, and at the same time the curve of density shows a sharp point of inflection corresponding to the boundary between the nucleus and the atm. In the nucleus the mols. are regarded as diatomic, because of the great pressure, while in the atm. they are monatomic. Assuming a compn. which gives the mean density of 1.41 where the pressure is 1500 atm. a table is given showing the compn. at various depths, for the nucleus and the atm. The marked change in density at the point of inflection makes the atm. analogous to that of the earth. Effects of heating and cooling are briefly discussed. The elements considered are Ta, Ag, Fe, Ca, Na, and H.

F. C. HOYT.

The fourth dimension. J. B. UBINK. *De Nieuwe Gids* 33, 791-802; *Chem. Weekblad* 15, 1269-70 (1918).—It is suggested that the hypothesis of the 4th dimension

may open up fruitful perspectives in the study of stereoisomerism, and of intramol. phenomena in general.

JULIAN F. SMITH.

**Tintometry.** E. SCHELL. *J. Soc. Leather Trades Chem.* 2, 297-9(1918).—In order to match colored cloths with samples, and generally in the use of Lovibond's tintometer, it is necessary that comparisons be made in homogeneous and uniform illumination. This may be attained in a black chamber, illuminated from a source uniformly defined so as to arrive at results which are comparable and independent of the atm. Moore's light, produced by the electric incandescence of  $\text{CO}_2$  in a high and const. vacuum is the light best fitted for this service.

W. B. J.

**The design and test of standards of mass.** U. S. Bur. Standards, *Circular* 3, 8pp.(1918).—This circular treats of the types of weights used as standards of mass and of their design, test, and adjustment. Information is given relating to the manner of using weights, and complete routine for their verification, test and intercomparison is developed. Tables facilitating the comparison of tolerance and precision of corrections, and the computation of corrections, are included.

E. H.

OSTWALD, WOLFGANG: *A Handbook of Colloid Chemistry. The Recognition of Colloids. The Theory of Colloids and their General Physico-Chemical Properties.* 2nd Ed. Revized by Martin H. Fischer. Numerous notes added by Emil Hatschek. Philadelphia: P. Blakiston's Son & Co. 284 pp. \$3.50.

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

**Radium: Its properties and occurrence in nature.** RICHARD B. MOORE. *Metal Record* 4, 391-3(1918); cf. *C. A.* 12, 2157.

C. G. F.

**Atomic refraction and atomic dispersion of quadrivalent lead deduced from the saturated lead tetraalkyls.** GERHARD GRÜTTNER AND ERICH KRAUSE. *Ann.* 415, 338-62(1918); *J. Chem. Soc.* 114, II, 382-3.—Hitherto, the at. refraction of quadrivalent lead, 17.87 for the red H line ( $n^2$  formula) has been deduced from only 1 compound,  $\text{PbEt}_4$ . Since it is known that the at. refraction of Si, derived from the silanes, varies between 7 and 8, it is desirable that the value for Pb should be recalcd. and for this purpose the numerous Pb tetraalkyls prepd. by G. and K. are well suited, since they are colorless stable liquids. The values of the at. refraction and dispersion of quadrivalent Pb depend on the no. of C atoms in the mol. and increase from  $\text{C}_4$  to about the  $\text{C}_{12}$  compds. The values calcd. from the simple, completely symmetrical Pb tetraalkyls ( $\text{PbR}_4$ ) increase regularly with the mol. wt. G. and K. are decidedly of the opinion that there are no const. values. The at. refraction ( $H_\alpha$  line) increases from 17.07 for the  $\text{C}_4$  compd. to 18.16 for the  $\text{C}_{11}$  compds. and the at. dispersions increase from 1.43 to 1.75 ( $H_\gamma - H_\alpha$ ), and from 0.87 to 1.05 ( $H_\beta - H_\alpha$ ). Certain regularities in the b. p., densities and refractions and dispersions of Pb alkyls and Si alkyls are recorded.

C. J. WEST.

**The ultraviolet spectra of magnesium and selenium.** J. C. McLENNAN AND J. F. T. YOUNG. *Univ. Toronto. Phil. Mag.* 36, 450-61(1918).—Owing to the theoretical interest in the exact values of spectral lines in connection with atomic structure from the standpoint of the quantum theory it has been necessary to make observations far down in the ultraviolet and Schumann regions. The present paper gives the results for Mg and Se. The spectra of Mg for the spark and for the arc both in air and for the arc *in vacuo* have been investigated between  $\lambda = 2000 \text{ \AA. U.}$  and  $\lambda = 2852.22 \text{ \AA. U.}$ , and about 58 new lines have been measured. The line  $\lambda = 2026 \text{ \AA. U.}$  has been

confirmed and support obtained for the existence of the series  $\nu = (1.5S) - (m, p_1)$ . For Se 12 new lines between  $\lambda = 2200$  and  $1850 \text{ \AA}$ . U. have been observed and measured in the spark spectrum, and 5 new lines in the Se arc for the same region. The absorption spectrum of Se metal in the C arc was investigated and a reversal found for  $\lambda = 1960$ , which is the strongest line in both the arc and spark spectra. If the absorption of Se vapor should prove analogous to that of Hg, Zn, and Cd this would indicate that the two series  $\nu = (1.5 S) - (m, p)$  and  $\nu = (1.5 S) - (m, p_1)$  for Se are in the extreme ultraviolet.

S. C. LIND.

**Fundamental frequencies in the spectra of various elements.** J. C. McLENNAN AND H. J. C. IRETON. Univ. Toronto. *Phil. Mag.* 36, 461-72(1918).—With a view to confirming photographically the result of Davis and Goucher (*C. A.* 11, 3173) regarding the potentials at which Hg vapor of low density emits certain radiations, expts. of McL. have been repeated and extended to other vapors. When Zn and Cd vapors are bombarded by electrons of increasing velocity, monochromatic radiation is suddenly emitted when the voltage is that given by the quantum relation for the frequency  $\nu = (1.5 S) - (2, p_1)$ . On further increasing the voltage no additional radiation was observed until that corresponding to  $\nu = (1.5 S) - (2, P)$  was applied. The wave lengths corresponding to both series were then recorded photographically. It was also shown that a Bunsen flame fed with heated vapor of Zn emits a monochromatic radiation  $\lambda = 3075.99 \text{ \AA}$ . U. From the standpoint of electronic vibrations within the atom, it appears that the series  $\nu = (1.5 S) - (m, P)$  is the more fundamental for Hg, Zn, Cd, Mg, Ca, and probably also for Sr and Ba.

S. C. LIND.

Effects of ring closure on spectrochemical properties (VON AUWERS) 10. Spectrochemistry and determination of the constitution of tautomeric compounds (VON AUWERS) 10. Spectral analysis of the plant coloring matters of the flavone group (SHIBATA, KIMOTSUKI) 10.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

M. O. Leighton. ANON. *Elec. World* 73, 243(1919); illus.—Biographical sketch.  
C. G. F.

**Future of the American electrochemical industry.** S. W. MAHER. *Met. Chem. Eng.* 18, 513-4(1918).—In view of inadequate power for future development of the electrochem. industry, it is doubtful if Niagara Falls will remain the leading electrochem. center of the country. The advantages of the S. W. Appalachian region lying between the Cumberland Mountains on the north and the Blue Ridge System on the south are discussed, and it is pointed out that this territory offers an interesting field for closer investigation, as it has the necessary factors for cheap power, and in addition has raw materials such as salt, lime, coal, bauxite, Fe, Mn, chrome and Ni, as well as assembling and distributing facilities and building materials.

H. JERMAIN CREIGHTON.

**Central stations and the manufacture of electrochemical products.** C. A. WINDER. *Met. Chem. Eng.* 18, 354-6(1918).—W. deals with power consumption in manuf. of numerous electrochem. products, the difficulties encountered due to the relatively high frequency furnished by the central stations and the impracticability of off-peak power. Water power is more economical than steam only when the load factor is 60% or more.

W. H. BOYNTON.

**Some developments in the electrical industry during 1918.** JOHN LISTON. *Gen. Elec. Rev.* 22, 9-47(1919); cf. *C. A.* 12, 2164.—A review.

C. G. F.

**British electric steel furnaces.** F. J. MOFFETT. *Iron Age* 103, 120(1919).—See C. A. 13, 209. W. H. BOYNTON.

**Size vs. recoveries in ferromanganese furnaces.** E. S. BARDWELL. *Chem. Met. Eng.* 19, 749(1918).—B. has examd. a no. of elec. furnaces of the same type working under the same conditions, with transformer capacities between 1500 and 3000 k. v. a. The crucibles consisted of tanks ranging in size from  $7\frac{1}{2} \times 15 \times 4\frac{1}{2}$  ft. deep to  $12 \times 20 \times 9$  ft. deep, with linings of carbon electrode butts. Three-phase, 60-cycle current was used, with 3 electrodes. The voltages varied between 65 in the smaller to 100 v. in the larger furnaces. The charges consisted of Mn ore, coal, Fe turnings, and limestone. In the case of the smaller furnaces, operating at low voltages, the slag loss was low and the volatilization loss almost nil. The larger furnaces operating at higher voltages showed increased loss of Mn in slag and greatly increased volatilization. The effects in the latter case are ascribed to irregular furnace working, excessively high local temperatures, and the formation of carbide and graphite accretions beneath the electrodes. Substituting coke for a part or all of the coal, thereby decreasing the resistance of the charge and making possible a lower operating voltage, is recommended in such cases. A. L. FIELD.

**The aluminium industry in 1918.** ANON. *Metal Ind.* 17, 2(1919). E. H.

**Melting brass in the induction furnace.** G. H. CLAMER. *J. Am. Inst. Metals* 11, 381-95(1917).—C. discusses the general principles of the induction furnace and describes in detail the Ajax-Wyatt type. This furnace employs a closed channel with a pool above and circulation of the liquid metal in the channel. 60/40 brass may be melted without volatilization of Zn in the channels of the secondary circuit so long as the cold metal is being fed into the furnace or the bath has not in entirety reached the volatilization point of Zn. In charging, it is necessary to guard against bridging of the charge. Constant energetic automatic circulation results from the motor effect, pinch effect and Joule effect. The power factors of 30- and 60-kw. furnaces are 85% and 72%, respectively. These furnaces operate on single phase circuit, 220 v., 60-cycle. The furnace as developed is intended only for Cu-Zn alloys containing no more than 3% Pb. W. H. BOYNTON.

**Making electric furnace bottoms.** A. W. LORENZ. *Foundry* 46, 403(1918).—The refractory mixt. used for the bottom should be rammed well in layers an inch thick. FeO should be kept down as this is reduced to Fe by the coke, thus diminishing the strength of the bottom. It is probable that to secure the best results, a basic elec. furnace bottom should contain as little oxidizing material as possible and should be burned-in thoroughly with non-reducing flame. H. JERMAIN CREIGHTON.

**Muscle Shoals nitrate plant.** ANDREW M. FAIRLIE. *Chem. Met. Eng.* 20, 8 (1919).—F. discusses generally the need of nitrates and why a great construction of coke ovens is undesirable. The Haber and arc processes are mentioned and the reason for choosing the cyanamide process is given. The location of the Muscle Shoals plant is described and a tabulation of the important departments given. This plant will require 90,000 kw.; 60,000 v. to be furnished by a steam plant and 30,000 by the Alabama Power Co. Ultimately the hydro-elec. plant will supply the power in addition to the steam plant. Information is given as to the size and kind of boiler room equipment. The elec. current at 12,000 v. will be transmitted to the plant through a special bus tunnel of concrete and brick. A carbide material department pulverizes and dries coal, calcines limestone in rotary kilns 125 ft. in length and of 200 tons' capacity per day, and dries and crushes coke. The carbide furnace dept., with 12 furnaces, will produce 600 tons of  $\text{CaC}_2$  per day, this material then passing to a cooling and crushing dept. containing three  $36'' \times 4''$  Buchanan crushers giving  $1\frac{1}{4}$  inch carbide which

with Hardinge mills and Smidth mills is further pulverized to 200 mesh. A liquid-air plant based on the Claude system will contain 30 N columns. Details of air purification, size of machinery and capacity are given. For cyanamide 1536 ovens are provided. Conversion of cyanamide to  $\text{NH}_3$  takes place in 56 autoclaves, equipped with agitators. Steam and caustic soda free the  $\text{NH}_3$ , which is then catalytically oxidized by platinum gauze to  $\text{NO}$  and  $\text{NO}_2$  and then further oxidized in oxidation towers to  $\text{N}_2\text{O}_4$ . Absorption towers yield the nitric acid. With  $\text{NH}_3$  gas,  $\text{NH}_4\text{NO}_3$  is formed, which is crystallized in proper evaporating pans. The article gives rather full information on the sizes, the construction, the capacities, power used and general operation of each part mentioned above.

EDWIN T. ALLEN.

Construction and operation of an electrolytic copper refinery. J. E. McALLISTER. *Eng. Mining J.* 106, 337-40 (1918).—A detailed description of the probable cost of construction of an elec. refinery to handle 50,000 tons Cu annually. Economic aspects are discussed, the basis of cost estimate is defined, proposed practice outlined, and estimated initial and operating expenses are given. It is assumed that high-tension a. c. can be delivered at low-tension terminals of transformers at the rate of \$15 per h. p. year. The arrangement of the plant is illustrated by a plan. Construction costs amount to \$1,502,800, and operating costs to \$13.112 per T refined Cu, divided as follows: labor \$5.669, material \$1.332, fuel \$1.895, power \$1.301, overhead \$1.378, interest on investment \$1.537.

H. JERMAIN CREIGHTON.

Maintenance of high ampere efficiency in electrolytic copper refining. M. H. MERRISS AND M. A. MOSHER. *Eng. Mining J.* 106, 95-7 (1918).—The importance of freshly cleaned oiled contacts is emphasized and the proper method of hanging the thin cathode starting sheets is described. Anodes and cathodes must be placed equidistant and should be properly centered in the tank. The use of voltmeters to detect short circuits and bad contacts is explained, and the importance of cleanliness discussed. In conclusion a number of pointers are given for the light-copper fixer.

H. JERMAIN CREIGHTON.

Electrolytic silver and gold refining at Perth Amboy, N. J. G. G. GRISWOLD. *Trans. Am. Electrochem. Soc.* 35, 1-7 (1919) preprint.—An illus. description of the refining of Ag and Au bullion by the Moebius process. The vertical type of app. proves the more satisfactory as it insures a greater capacity for a given floor space, smaller tie-up and cheap production of 990 fine or better anodes in connection with a Pb refinery. The tank room contains 24 sections of 6 tanks each, sections in series, and the tanks in multiple. Stoneware tanks supercede the original wooden ones. Ag anodes (2.8 kg.) are cast, weighed, counted, punched and used as required. Cold-rolled Ag sheet 0.8 mm. thick forms the cathodes. Four new anodes in bags and 5 cathodes are suspended in each tank. The neutral nitrate electrolyte contains 15-20 g. Ag, and 30-40 g. Cu per l. A c. d. of 440 amp. per sq. in. is utilized, the current being carried by Cu cables through Hg-filled Cu cups over cold-rolled Cu bus bars. The Au slime after removal of Cu is washed, dried and cast into anodes for refining by the Wohlwill process. This installation has 5 stoneware cells in series with the Ag sections. With the high c. d. required (1650 amp. per sq. in.) osmosis developed in the stoneware causing cracking. Hg cups on the ends of the bus bars allow cut in or out by means of Cu bars. Rolled electrolytic Au cathodes are connected to the contact bars by bending one end around them and clipping fast. The electrolyte contains 30% free HCl, 80-5 g. Au per l. and varying small amounts of Pt and Pd. W. H. BOYNTON.

The electrolytic behavior of manganese in sulfate solutions. G. D. VAN ARSDALE AND C. G. MAIER. *Trans. Am. Electrochem. Soc.* 33, 33-48 (1918).—Exptl. results show that Mn can be deposited at the cathode from neutral sulfate solns. with 80-90%



efficiency at 3 v. or more, but the deposit is powdery, and a concn. of 0.36% free  $\text{H}_2\text{SO}_4$  prevents deposition. It is efficiently deposited as  $\text{MnO}_2$  at the anode from solns. containing 5%  $\text{MnSO}_4$  in the form of a dense, black, lustrous film. Curves show current efficiencies for various c. d.'s and at different temps., and concns. Temp. increase lowers the current efficiency rapidly for cathode deposition, but greatly improves it in the case of deposition as  $\text{MnO}_2$ . Theories for these results are given, and the effect of impurities on the  $\text{MnO}_2$  deposit pointed out.

W. H. BOYNTON.

Electrolytic pickling of steel. C. HERING. *Metal. Chem. Eng.* 18, 282(1918).—Polemical (cf. C. A. 12, 790-1). In the removal of scale by the electrolytic process there is much less attendant loss of metallic iron and of  $\text{H}_2\text{SO}_4$  than by the chem. process.

W. H. BOYNTON.

Review of the plating industry for 1918. CHARLES H. PROCTOR. *Metal Ind.* 17, 15-7(1919).

E. H.

Nickel solutions. E. P. LATER. *Foundry* 46, 213-5(1918).—Troubles with the plates are considered and some remedies discussed. It is pointed out that if the bath is too acid or the metal content too low, the Ni deposit will peel. A deposit with a yellowish tinge is due to an alk. condition of the bath, which may be corrected by the addition of  $\text{H}_2\text{SO}_4$ . In conclusion a number of suggestions for cleaning are given.

H. JERMAIN CREIGHTON.

Nickel plating cast or sheet aluminium. C. H. P. *Metal Ind.* 17, 25(1919).—After cleaning, polishing, etc., the Al is plated at 3-3½ v. in a soln. containing: Water 3.791,  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  284 g.,  $\text{NiSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  56.7 g.,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$  56.7 g., and  $\text{H}_3\text{BO}_3$  56.7 g. A double-throw switch is used, whereby the Al articles are momentarily made the anode, and the oxide film is dissolved. Then, reversing the switch, the articles become cathode and Ni is deposited. Contamination of the acid dip or deoxidizing soln with Cu is prevented by the use of soft iron for stringing purposes. This also maintains the Fe necessary in the dip. After Ni plating, Al articles may be plated in any cyanide bath for brass, Cu, Ag or Au.

W. H. BOYNTON.

Preparation and use of rapid nickel baths. E. P. LATER. *Foundry* 46, 23-5(1918).—Good deposits have been obtained from a bath containing 32 oz.  $\text{NiSO}_4$ , 3 oz.  $\text{NiCl}_2$  and 3 oz. boric acid per gal. when working under the following conditions: 49 amp./sq. ft. at 25°, 130 amp./sq. ft. at 25°, 295 amp./sq. ft. at 67°, 422 amp./sq. ft. at 71° and 890 amp./sq. ft. at 92°. In the operation of hot baths the regulation of the acidity is of importance, as hot baths quickly become alk., with the resultant production of dull deposits. Furthermore, the conductors must be able to handle the current without heating.

H. JERMAIN CREIGHTON.

Zinc cyanide plating solutions. F. J. LISCOMB. *Metal Ind.* 16, 552-3(1918).—The desired concns. of  $\text{Zn}(\text{CN})_2$ , NaCN and NaOH may be economically obtained by use of  $\text{ZnO}$ , NaCN and NaOH. Equations and examples are given. The economy is dependent upon market prices of the reagents, but results are equal to those obtained by the use of  $\text{Zn}(\text{CN})_2$ .

W. H. BOYNTON

Electro-galvanizing booster cases, adapters, and detonator fuse components for the United States Government. T. C. EICHSTAEDT. *Metal Ind.* 17, 22-4(1919).—A detailed description of the processes and equipment used. Steel racks hold 12 booster cases and have 10 small Zn anodes, each of which has a cotton stocking to prevent particles of Zn from falling into the cases. Thirteen anodes run crosswise of the tank and a cathode rod runs lengthwise along the side of the tank. The tank is fitted along the top on each side with Cu buss bars upon which anode rods are placed and make a contact. On the anode rods are suspended 5 elliptical Zn anodes 6 in. (15.2 cm.) long. The inside anode holders are drilled on each end to fit on pins in the

buss bars. Plating required 20 min. at 2 v. and 275-300 amp. Adapters are handled on steel wire trees with brass hooks to fit the conveyor plating tank. After cleaning, pickling and rinsing, the adapters are dipped into a soln. containing 15 g. NaCN per 3.79 l., then into a Zn strike soln. and thence to the plating tank. The plating soln. contains: Water 3.79 l.,  $\text{Zn}(\text{CN})_2$  170 g., NaCN 170 g., NaOH 57 g.,  $\text{SnCl}_2$  28 g., soda ash 57 g., and is used at 43-9°. Detonator fuses have 4 parts to galvanize: cap, washer, safety pin, and firing pin. The standard electro-galvanizing soln. consists of a strike and a finishing soln.— $1\frac{1}{2}$  hr. in each soln. The plating is made automatic as nearly as possible by use of rotary cleaning app., self-emptying bbls. with self-emptying rinsing and drying app.

W. H. BOYNTON.

**A new lead plating solution.** J. HAAS, JR. *Metal Ind.* 17, 12(1919).— $\text{Pb}(\text{CN})_2$  is prepd. by dissolving Pb in  $\text{HNO}_3$ , eliminating excess of the latter, and adding enough NaCN just to ppt. the  $\text{Pb}(\text{CN})_2$ . The ppt. is allowed to settle the soln. syphoned off, water added, the mixt. boiled, the undissolved  $\text{Pb}(\text{CN})_2$  allowed to settle and the soln. electrolyzed. The voltage is maintained at 1.75 v. with a max. c. d. of 4 amp. per sq. ft. (928.6 sq. cm.) and the temp. at 70°. The anodes are coated heavily white. By addition of 170 g.  $\text{KNaC}_4\text{H}_4\text{O}_6$  per 3.79 l., a const. current strength is maintained, anodes are kept clean, and the same deposit is obtained.  $\text{Pb}(\text{CN})_2$  is suspended from the sides in bags. By boiling the soln. toward evening it will remain warm enough to prevent settling out of  $\text{Pb}(\text{CN})_2$  during the night. W. H. BOYNTON.

**Planning a metal finishing department.** ANON. *Metal Ind.* 17, 5-6(1919).—An itemized estimate for complete equipment of a plating room, already partially outfitted. The arrangement is illustrated.

W. H. BOYNTON.

The Cottrell processes in the sulfuric acid industry (HEIMROD, EGBERT) 18. Design of transmission line porcelain insulators (GILCHRIST, KLINEFELTER) 19. Annual review on the various metals, metal products, ores, etc., for 1918 9. Unique features of an Illinois foundry (LUNDBERG) 9. Perkin medal award to Dr. Cottrell 18.

**Dry cell electric battery.** N. K. CHANEY. U. S. 1,287,634, Dec. 17. C is prepd. for use in the mixt. of a dry cell battery (after mixing with  $\text{MnO}_2$ ) by wetting it with an acid, e. g., HCl,  $\text{HNO}_3$  or  $\text{H}_2\text{SO}_4$ , adding an oxidizing agent such as  $\text{Ca}(\text{OCl})_2$  or  $\text{H}_2\text{O}_2$  to oxidize the FeS present and then adding sufficient ZnO to neutralize any excess acid. This treatment increases the voltage and "shelf life" of dry cells.

**Electrolytic iron.** A. T. C. ESTELLE. Can. 188,462, Jan. 28, 1919. Fe compds. are treated with caustic alkali at high temp. and the slime produced is subjected to electrolysis.

**Electric furnace.** W. K. BOOTH. U. S. 1,287,849, Dec. 17. A monolithic mass of  $\text{CaC}_2$  is used for the wall-contact of the furnace.

**Electric furnace suitable for iron or steel making and for reducing ores.** L. L. SIMPSON. U. S. 1,288,240, Dec. 17. The pat. relates especially to water-jacket construction.

**Three-phase electric furnace.** F. T. SNYDER. Can. 188,104, Jan. 7, 1919. The furnace has two upper electrodes and a bottom control and reactance is provided in the path of lowest resistance of such unit as automatically to equalize the currents flowing in the different phases of the polyphase system.

**Electric induction furnaces.** O. C. BOCKMAN. Can. 188,205, Jan. 14, 1919. In each phase of the furnace is arranged a regulable path for the magnetic flux in parallel with the ordinary flux path in order to regulate each sep. phase of the furnace independently of the other phases and of the current on magnetic coils.

**Treating gases in the electric arc.** F. H. A. WIELGOLASKI. U. S. 1,287,807, Dec. 17. The pat. relates to an app. and method of use for treating gases, such as air for fixing N, in such a manner as to prevent, so far as possible, decompn. of the product. Gases to be treated are introduced into the arc chamber along substantially its entire length, conducted toward the arc so as to effect a relatively prolonged contact of the gases with the arc and are then withdrawn through a restricted outlet through a hollow electrode into a cooled chamber in which a materially lower pressure is maintained than in the arc chamber. U. S. 1,287,808 relates to a method of arc-treatment of gases with elongated bent arcs, in which insulating walls of transversely moving cold gases are maintained between the bends of the arcs to prevent short-circuiting of the arc upon itself.

**Ammonia from the elements.** A. CLASSEN. Norw. 28,990, Aug. 5, 1918. N and H are subjected, in the presence of contact substances, to the action of elec. discharges. Cf. C. A. 12, 884.

**Metallic cerium.** A. and M. HIRSCH. Can. 188,090, Dec. 31, 1918. A cerium salt is prepd. and electrolyzed at a bath temp. of about  $850^{\circ}$ , terminal voltage 12 and amperage over 200. The temp. of the bath is finally raised to promote the agglomeration of the deposited metal. Cf. C. A. 12, 1860.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**Elimination of the volume of a precipitate.** H. D. STEENBERGEN. *Tilburg. Chem. Weekblad* 15, 1268-9(1918).—In analyses in which the soln. is filled up to a known vol., the method of double diln. can be used for accurate correction of the error due to the vol. of the ppt. It is shown mathematically when the sample is dild. to 100 and to 200 cc., the correction to be applied is  $Cv^2/(200-v)(100-v)$ , where  $v$  is the vol. of the ppt. and  $100C$  is the total quantity of the substance under analysis present in the sample.

JULIAN F. SMITH.

**Calculation of the error in a volumetric analysis.** V. ZOTIER. *Bull. sci. pharmacol.* 25, pt. 2, 274-82(1918); cf. *Bull. sci. pharmacol.* 24, 298(1917).—A discussion, replete with mathematical formulas and examples, taking into consideration the errors due to app., indicators, and the solns. themselves.

M. HEIDELBERGER.

**Improved method of sulfur analysis.** F. G. HAWLEY. *Eng. Mining J.* 105, 385-6(1918).—H. recommends the following method for detg. S (except that present as  $\text{BaSO}_4$ ) in ores and furnace products: Weigh 0.5 to 1 g. of the sample into a 400-cc. Griffin beaker, cover with a watch glass, add 10 cc. of a 20% aq. soln. of  $\text{NaClO}_3$ , and 7 to 15 drops of a mixt. of equal parts of Br and glacial AcOH. Add 10 cc. of  $\text{HNO}_3$  nearly satd. with  $\text{KClO}_3$  and shake until sample and soln. are mixed. If the S content is high it may be advisable to place the beaker in a cooling bath or trough for a few min. In 2 or 3 min., or as soon as no unoxidized S can be seen, place the beaker on the hot plate and evap. carefully to dryness. Cool, add 5 cc. of  $\text{HCl}$  (3:2) and again evap. to dryness; take up with 10 cc. of  $\text{HCl}$  (3:2), heat until all sol. matter is dissolved, dil. to 150 cc., neutralize with  $\text{NH}_4\text{OH}$ , and add 10 cc. in excess. If Pb is present, add about 1 g. of  $(\text{NH}_4)_2\text{CO}_3$ . Heat to boiling and boil 1 min.; filter through a 15-cm. paper and wash 6 or 7 times, boil the filtrate to expel most of the  $\text{NH}_3$ , neutralize with  $\text{HCl}$ , and add 2 to 3 cc. in excess. Add dropwise 3 to 5 cc. of 10%  $\text{BaCl}_2$  soln. and then run in at once about 10 cc. more; boil 10 min., let settle, filter, wash, ignite, and weigh as  $\text{BaSO}_4$ . If the sample contains less than 1% of S, it is better to evap. to a vol. of 100 cc. or less, to use a smaller excess of  $\text{HCl}$ , to boil longer, and to let

stand overnight. H. reports results on a mat (25.6% S), showing excellent agreement of the method with the Allen and Bishop and other procedures; the aqua regia method indicated less than 20% of S. F. W. SMITH.

**Determination of molybdenum in ores.** W. J. CROOK AND M. L'A. CROOK. *Mining Sci. Press* 117, 313-4(1918).—The authors recommend the following: *Volumetric methods:* (1) For ores or Fe-Mo. Fuse in a Ni crucible 0.5 to 1 g. of the sample with 4 g.  $\text{Na}_2\text{O}_2$  till liquid; continue heating for 5 min. more and run the fusion up on the sides of the crucible (the temp. should not exceed a dull red heat). Cool, ext. with  $\text{H}_2\text{O}$  in a beaker and rinse the crucible; boil down to about 150 cc., filter, wash with hot  $\text{H}_2\text{O}$  and acidify the filtrate with  $\text{AcOH}$ . Heat to boiling and titrate the colorless soln. with  $(\text{AcO})_2\text{Pb}$  soln. (25 g. + a little  $\text{AcOH}$ , dild. to 1 l.), using tannic acid (0.1 g. in 30 cc.  $\text{H}_2\text{O}$ ) as an outside indicator. When much Fe is present in the sample, fuse 10 g.  $\text{NaOH}$  in a Ni crucible till a pasty mass is formed; mix the sample with 3 g.  $\text{Na}_2\text{O}_2$  and carefully add the mixt. portionwise. When the fusion is complete, add 3 g. more of  $\text{Na}_2\text{O}_2$  and conduct the fusion as before. The authors describe in detail the prepn. of  $\text{PbSO}_4$ , its use in standardizing a standard  $(\text{NH}_4)_2\text{MoO}_4$  soln., and the use of the latter to det. the titer of the  $(\text{AcO})_2\text{Pb}$  soln. (2) Dissolve 2 g. of the sample in 20 cc.  $\text{HNO}_3$ , 20 cc.  $\text{HCl}$ , and 20 cc.  $\text{H}_2\text{O}$ . After 10 or 15 min. add 20 cc. of 60%  $\text{H}_2\text{SO}_4$  and evap. until copious fumes are evolved. Cool, dil., filter off  $\text{PbSO}_4$  and siliceous matter, heat the filtrate to boiling and add a few crystals of  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ ; boil a few min. to destroy the persulfate, cool, and ppt. with  $\text{H}_2\text{S}$  for 1 hr. Boil for a few min. and filter; wash with  $\text{H}_2\text{S}$  water. Transfer as much of the ppt. as possible back to the beaker with  $\text{H}_2\text{O}$ ; dissolve that remaining on the paper with boiling dil. aqua regia (1 part  $\text{HNO}_3$ , 1 part  $\text{HCl}$ , and 3 parts  $\text{H}_2\text{O}$ ), receiving the soln. in the beaker containing the ppt., and boil until all is dissolved. Filter off any S, add 5 cc. of 60%  $\text{H}_2\text{SO}_4$  and evap. till white fumes are evolved; cool, dil. to about 60 cc., and neutralize with  $\text{NH}_4\text{OH}$  (1:1) till there is a distinct odor of  $\text{NH}_3$ . If a white or yellowish ppt. of Bi forms, filter. Neutralize the soln. with  $\text{AcOH}$ , add 5 g.  $\text{AcONa}$  and titrate with  $(\text{AcO})_2\text{Pb}$  as above. (3) Useful when Mo and W are present in the same sample. Weigh out the sample and fuse as in (4). Dissolve the melt in hot  $\text{H}_2\text{O}$ , and filter; boil the filtrate and add 20 cc. of Mdivani's reagent (50 g.  $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$  in 200 cc. concd.  $\text{HCl}$ ) for each 0.15 g. of  $\text{WO}_3$  present. The vol. of the soln. should be kept between 60 cc. and 300 cc. according to the amt. of W present. Boil for 3 min., filter, and wash the blue ppt. with hot 5%  $\text{HCl}$  till the filtrate gives no test for Mo when tested as follows: If a drop of a satd.  $\text{HgNO}_3$  soln., followed by from 1 to 1.5 cc. concd.  $\text{HCl}$  and an excess of  $\text{KI}$  is added to the soln. to be tested, and the mixt. shaken until the  $\text{HgI}$  is completely dissolved, the presence of Mo or W is indicated by a blue color, developed either at once or after a short time. Test for Mo by adding  $\text{KCNS}$  and extg. with ether (blood-red to orange color). If the estn. of W is required, ignite the blue ppt. in a porcelain crucible, and weigh as  $\text{WO}_3$ . Evap. the filtrate to a small vol., cool, transfer to a 250-cc. volumetric flask and dil. to mark; mix and transfer 50 cc. to a beaker, add 5 to 10 g. of sheet Zn to ppt. the Sn, let stand 10 min., filter, and wash the residue with hot  $\text{H}_2\text{O}$ . Heat the filtrate to  $60^\circ$ , and pass through a Jones reductor (50 cc. 2.5%  $\text{HCl}$ , then the Mo soln., then 150 cc. of 2.5%  $\text{HCl}$ , and finally 150 cc. hot  $\text{H}_2\text{O}$ ) into 20 cc. of 10%  $\text{Fe}^{+++}$  alum soln. + 20 cc. of "titrating soln." (90 g.  $\text{MnSO}_4$ , 650 cc.  $\text{H}_2\text{O}$ , 175 cc.  $\text{H}_3\text{PO}_4$ , and 175 cc.  $\text{H}_2\text{SO}_4$ ). Titrate with 0.1 N  $\text{KMnO}_4$ , correcting for a blank ( $\text{Fe} \times 0.605 = \text{Mo}$ ). *Gravimetric methods:* (4) Mix 0.3 g. of the sample with equal parts of  $\text{Na}_2\text{CO}_3$  and  $\text{Na}_2\text{O}_2$ , and fuse in a Ni crucible, finishing at a bright red heat. Cool, dissolve the melt in hot  $\text{H}_2\text{O}$  and filter; treat the filtrate with an excess of yellow  $(\text{NH}_4)_2\text{S}_x$  and warm on the  $\text{H}_2\text{O}$ -bath. Add portionwise a slight excess of dil.  $\text{H}_2\text{SO}_4$ , blow a current of air through the soln. to remove

the excess of  $\text{H}_2\text{S}$ , filter, wash, and dry the ppt. Remove as much as possible of the ppt. from the paper to a porcelain crucible; burn the filter separately, and add the ash. Convert the  $\text{MoS}_3$  to  $\text{MoO}_3$  by heating over a small flame, cool, and weigh. (5) Digest 0.3 g. of the sample with 25 cc. of fuming  $\text{HNO}_3$  for several hrs., and evap. to dryness. Treat the residue with 2 or 3 cc.  $\text{H}_2\text{SO}_4$  and take up with 50 cc.  $\text{H}_2\text{O}$ ; filter while warm, wash with  $\text{H}_2\text{O}$ , with dil.  $\text{NH}_4\text{OH}$ , and again with  $\text{H}_2\text{O}$ ; ppt. the Al and Fe in the filtrate with  $\text{NH}_4\text{OH}$ , filter, evap. the filtrate to 150–200 cc., and add an excess of yellow  $(\text{NH}_4)_2\text{S}_x$ . If present, filter off CuS, add HCl, and warm the soln. Filter off the  $\text{MoS}_3$ , evap. the filtrate to dryness, and expel most of the  $\text{NH}_4$  salts; cool, dissolve the residue in  $\text{NH}_4\text{OH}$ , and add  $(\text{NH}_4)_2\text{S}$ . Filter, add the ppt. of  $\text{MoS}_3$  to that previously obtained; ignite the ppts. with S in a current of H, cool and weigh as  $\text{MoS}_3$  (or ignite to  $\text{MoO}_3$ ). (6) U. S. Bureau of Mines' method for ores containing only traces of As or Sb. Digest 0.2 to 0.5 g. of sample with 25 to 35 cc. of fuming  $\text{HNO}_3$  for 3 hrs., and finally evap. to dryness. Add 3 cc. concd.  $\text{H}_2\text{SO}_4$  and evap. until copious fumes are evolved. Cool, dil. to 100 cc., filter, and wash with  $\text{H}_2\text{O}$ . Then wash the residue well with  $\text{NH}_4\text{OH}$  (1:3), and finally with  $\text{H}_2\text{O}$ ; render the filtrate ammoniacal, heat, filter, and wash well with hot  $\text{H}_2\text{O}$ . Sat. the alk. filtrate with  $\text{H}_2\text{S}$  to a bright cherry-red color, filter, and wash with hot  $\text{H}_2\text{O}$ ; render the filtrate slightly acid with HCl and digest until the ppt. and the S are coagulated and the excess  $\text{H}_2\text{S}$  is expelled. Filter through a weighed gooch; evap. the filtrate to dryness and drive off the  $\text{NH}_4$  salts at a low temp., being careful not to heat the dish to redness. Cool, take up the residue with 100 cc.  $\text{H}_2\text{O}$  and 5 cc.  $\text{NH}_4\text{OH}$ , add 10 cc.  $(\text{NH}_4)_2\text{S}$ , make faintly acid with HCl, and digest till the sulfide has coagulated. Filter through the gooch previously used, add an amt. of S to the combined sulfides equiv. to about  $\frac{1}{2}$  their wt., and ignite over a Bunsen burner at a dull red heat in a current of As-free H; cool, and weigh as  $\text{MoS}_3$ . A bibliography is appended.

F. W. SMITHER.

A method for the separation and determination of barium associated with strontium. F. A. GOOCH AND M. A. SODERMAN. *Am. J. Sci.* 46, 538–40 (1918).—A modification of the Mar procedure for sepg. Ba from Ca and Mg (cf. *Am. J. Sci.* [3] 43, 521 (1892)). Dissolve the dry mixed chlorides, contained in a beaker, in the least possible amt. of  $\text{H}_2\text{O}$  (beginning with about 0.2 cc. and, if necessary, adding more later), warming gently, with agitation, and then cooling. If crystals sep. on cooling, cautiously repeat the operation until a cold satd. soln. is obtained. Then add a 4:1 mixt. of 33% HCl and ether, dropwise and with const. agitation during the addition of the first 2 or 3 cc. of the precipitant. Then add the mixt. in amts. necessary to complete the pptn. of  $\text{BaCl}_2$  and dissolve the  $\text{SrCl}_2$  (50 to 75 cc. for amts. not exceeding 0.5 g. of the mixed salts nor 0.3 g. of anhydrous  $\text{SrCl}_2$ ). Decant the liquid upon asbestos in a gooch, and wash and transfer the residue to the filter with a 4:1 mixt. of concd. HCl (38%) and ether (applied in a fine jet from a small wash bottle); dry at  $150^\circ$  and weigh as anhydrous  $\text{BaCl}_2$ . The results reported of expts. made with weighed amts. of  $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$  and anhydrous  $\text{SrCl}_2$  show excellent agreement with theory.

F. W. SMITHER.

Influence of iron and organic matter on the iodometric estimation of chromium. R. LAUFFMANN. *Collegium* 1918, 223–8; *J. Soc. Leather Trades Chem.* 2, 308.—Cr was estd. iodometrically in a soln. of  $\text{Cr}_2(\text{SO}_4)_3$  (a) without and (b) with  $\text{FeCl}_3$ , and (c) with cane sugar, glucose, starch and sol. protein oxidized by  $\text{Na}_2\text{O}_2$  and by fusion mixt. When  $\text{FeCl}_3$  was used, the  $\text{Fe}(\text{OH})_3$  resulting from the  $\text{Na}_2\text{O}_2$  treatment was either (d) dissolved by excess HCl or (e) filtered off. In the soln. treated with  $\text{Na}_2\text{O}_2$  results were too high in (d) owing to the sepn. of I and too low in (e) from the adsorption of Cr soln. by the  $\text{Fe}(\text{OH})_3$ . Large amts. of organic matter in (c) caused inaccuracy by retarding I sepn. and the consequently indistinct end-point. If hydroxides of bases which do not sep. I and which are sol. in acid, result from the  $\text{Na}_2\text{O}_2$  treatment

they should be filtered off, dissolved in acid, and the Cr therein detd. iodometrically.

W. B. J.

Determination of small quantities of arsenic. O. BILLETER. *Helvetica Chim. Acta* 1, 475-98(1918).—The sulfuric acid soln. resulting from the Johnson-Chittenden method employed on org. matter, is distd. with NaCl. The HCl in the distillate is destroyed with HClO, Cl being evolved. The resulting liquid which now contains As<sup>3</sup>, is taken up with H<sub>2</sub>SO<sub>4</sub>, and transferred to the Marsh app. L. J. ROGERS.

Note on the gasometric determination of nitrates. C. A. HILL. *Analyst* 43, 215-6(1918).—An external reaction bottle is used in connection with the usual Hg-charged nitrometer. It is previously filled with a gas (CO) inert towards nitric oxide. ERLE M. BILLINGS.

The ignition of boric acid. C. R. BAGSHAW. *Analyst* 43, 138-9(1918).—Expts. are cited to prove that the detn. of boric acid in powder or ointment by ignition tends towards low results. ERLE M. BILLINGS.

Sulfide precipitation of group 2 (a) metals. JOSEPH SHIBKO. *Chem. News* 117, 253-4(1918).—For pptg. metals of this group (Cu, Cd, Pb, Hg, Sn) (NH<sub>4</sub>)<sub>2</sub>S is not recommended when Zn is present. The sulfides are slightly sol. in acid solns. and any excess of (NH<sub>4</sub>)<sub>2</sub>S would cause NH<sub>3</sub> to be liberated, thus pptg. some Zn. The use of H<sub>2</sub>S is preferred. ERLE M. BILLINGS.

Microchemical analysis and the detection of counterfeit coinage. F. WEEHUIZEN. *Geneesk. Tijdschr. voor Ned. Indië* 58, 198-200; *Chem. Weekblad* 15, 1521(1918).—A description of the microchem. detection of various metals, in connection with legal practice. JULIAN F. SMITH.

Comments on the analysis of anti-friction metals. R. NAMIAS. *Ind. chim. min. met.* 5, 130(1918).—In reply to the criticisms of Ferreri and Cavalli (*C. A.* 12, 2295) on his method of analysis (*C. A.* 12, 2294) N. states that he has not been able to verify the error due to lead which they report, but that after treatment with HNO<sub>3</sub> the residue is free from lead. There is no loss of Sb<sub>2</sub>O<sub>3</sub> by volatilization from the mixt. of oxides when, as in this case, there is much Sn and little Sb. Considerable Cu remains with the Sn, but can be removed and detd. accurately by fusion of the oxides with caustic and repeated treatment with HCl. The pptn. of Sb by means of Sn is much less troublesome than the authors state, and has the advantage of giving a delicate visible control. When there still remains a little Sb in the soln. after treatment with Sn and filtration, on adding a fresh piece of Sn and boiling a crit. concn. of acid is reached when the remaining traces are deposited as a black ppt. J. S. LAIRD.

A study of the test for tartrates depending upon the formation of the copper-tartrate complex. L. J. CURTMAN AND B. R. HARRIS. *J. Am. Chem. Soc.* 41, 207 (1919).—A correction. Phosphates and borates, even in amts. as high as 500 mg., do not respond in the same way as tartrates when treated by Böttger's procedure as previously stated (cf. *C. A.* 12, 31). E. J. C.

Determination of dextrose with hypoiodite. RICHARD WILLSTÄTTER AND GUSTAV SCHUDERL. *Akad. Wiss. München. Ber.* 51, 780-1(1918).—The method has the advantages of being rapid, accurate with small amts. and applicable even in the presence of ketoses. The course of the reaction depends only on suitable concns. and amts. of alkali. The hypoiodite soln. must not be too strongly alk., as it then reacts too slowly, while the hexose in the alk. medium undergoes the well known changes and, moreover, the gluconic acid formed is further oxidized during the reaction. The amt. of alkali must not be too small, however; it should at least be sufficient to neutralize the gluconic acid formed. The reaction proceeds very rapidly and smoothly with 0.1 N solns. of I and NaOH in the proportions corresponding to the equation HOCH<sub>2</sub>[CH-

$(\text{OH})_6\text{CHO} + \text{I}_2 + 3\text{NaOH} = \text{HOCH}_2[\text{CH}(\text{OH})_6]\text{CO}_2\text{Na} + 2\text{NaI} + 2\text{H}_2\text{O}$ . The glucose soln. is treated with about 2 times (1.5–4 times) the necessary amt. of  $N$   $\text{I}_2$ , then drop by drop at room temp. with shaking with 1.5 vols. of 0.1  $N$   $\text{NaOH}$ , allowed to stand 1.2–5 min. (with very small amts. of sugar, better 20 min.), then made faintly acid with dil.  $\text{H}_2\text{SO}_4$  and titrated with  $\text{Na}_2\text{S}_2\text{O}_3$ . In concns. of 1% glucose (e. g., 100 mg.) the greatest error is 0.1 mg.; the average error was a few hundredths of 1%; and in concns. of 0.1% (10 mg.), the error of individual detns. was less than 1.5%. Under the above conditions cane sugar and fructose use up no  $\text{I}_2$ . C. A. ROULLER.

**An iodine-tannin reagent.** I. D. E. TSAKALOTOS AND D. DALMAS. *Bull. soc. chim.* 23, 391–400 (1918).—This reagent consists of a mixt. of 1 cc. of 0.1  $N$  iodine and 1 cc. of 1% tannin soln., freshly prepared before each detn. It is used for *estg. the degree of alkalinity of solns.* particularly when very dil., giving good results with alk. solns. 0.000025  $N$ . A constant of 245 is used, as it is with this number that the calcd. iodotannic values approach nearest the degrees of alkalinity of the solns. in terms of  $\text{CaO}$ . The method consists in adding the liquid to be titrated from a buret in small portions to the reagent until an intense red color persists, then making very small additions of the liquid and also 5 cc. of starch soln. after each addition from the buret. When the starch soln. added ceases to give any blue color, the end-point has been reached and the iodotannic value, ( $A$ ), is obtained by dividing the number of cc. of soln. used for titration into the constant 245, and the result, with necessary corrections from tables, compares very closely with the degree of alkalinity found by acidimetric titration with indicators. Tests were run on different solns. of  $\text{KOH}$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NH}_4\text{OH}$ ,  $\text{Ca}(\text{OH})_2$ , of from 0.01  $N$  to 0.0001  $N$ , and the results obtained were very close to those found by other methods. Conc'd. alk. solns. can be directly titrated, but the most satisfactory way is to dil. with a known vol. of water and make a correction for the iodotannic value of the water added. The method was found adaptable to the estn. of the alkalinity of drinking waters, etc., and for detg. the alkalinity of org. liquids, such as blood, saliva, etc. J. E. CLARK.

Method for the preparation of soluble starch (SMALL) 28.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

**New mineral names.** W. E. FORD. Yale Univ. *Am. J. Sci.* 45, 477–8 (1918).—Continuing the series (cf. C. A. 12, 344), F. lists 5 additional minerals described during the latter part of 1917 and the early part of 1918. E. T. W.

**Chubutite and the significance of its halogen content.** E. RIMANN. *Anales. soc. quim. Argentina* 6, 323–8 (1918).—In a communication read before the Chem. Soc. of Argentina (C. A. 13, 298) H. Corti described "chubutite," a  $\text{Pb}$  mineral from Chubut, Argentina, which had been studied by R. Beder and F. Pastore and shown to have the formula  $7\text{PbO} \cdot \text{PbCl}_2$ . R. compares this mineral with other oxychlorides of  $\text{Pb}$ , especially loretoite, which was given the formula  $6\text{PbO} \cdot \text{PbCl}_2$  (Wells and Larsen, C. A. 11, 131). Chubutite has  $d. = 7.95$ , loretoite has  $d. = 7.39$ ; unfortunately the  $\eta$ s. of chubutite were not detd. It is possible that chubutite and loretoite are the same mineral. R. C. WELLS.

**Lattice-like inclusions in calcite from North Burgess, Ontario.** R. P. D. GRAHAM. *Mineral. Mag.* 18, 252–8 (1918).—The pale blue calcite from North Burgess township, Lanark Co., contains lattice-like inclusions of a hydrous  $\text{Mg}$  silicate. The white needles are arranged in three directions corresponding to the edges of the rhombohedron

(01 $\bar{1}2$ ), and may be sepd. from the enclosing  $\text{CaCO}_3$  by treatment with cold dil. acid. Apparently the needles were deposited along capillary channels developed by secondary twinning and are considered pseudomorphous in character. When examd. under the microscope they transmit very little light, have straight extinction, weak or medium birefringence and a sp. gr. about 2.50. The av. of 2 analyses gave:  $\text{SiO}_2$  56.80,  $\text{MgO}$  30.39,  $\text{FeO}$  2.06,  $\text{CaO}$  0.37,  $\text{H}_2\text{O}$  10.87%, which corresponds closely with the formula  $5\text{MgO} \cdot 6\text{SiO}_2 \cdot 4\text{H}_2\text{O}$ , which is that usually assigned to spadaite. Two possible sources are suggested for the Mg solns., either the original limestone contained some Mg which was set free and rendered available in the form of a soln. of Mg silicate during the metamorphism of the limestone; or alteration of Mg silicates contained in the cryst. limestone may have provided the necessary solns. W. F. HUNT.

The datolite locality near Westfield, Mass. EARL V. SHANNON. *Am. Mineral.* 4, 5-6(1919).—The occurrence of datolite in the diabase is described in detail. This mineral crystd., together with calcite and small amts. of other minerals, from mineralizing solns. which spread outward from fissures and entered open spaces between blocks of trap displaced by shearing and faulting. E. T. W.

Racewinite: a peculiar mineral from ore deposits in Utah. A. N. WINCHELL. *Econ. Geol.* 13, 611-5(1918).—This mineral comes from the Highland Boy mine, Bingham; in the mine it resembles chlorite. The color is bluish green on fresh fracture, changing slowly to black in air or water. It changes to yellow-brown in  $\text{HNO}_3$ , but remains insol.; partly sol. in  $\text{HCl}$  and changes color, as with  $\text{HNO}_3$ . Other properties are: fragile;  $H. = 2.5$ ; sp. gr. = 1.94-1.98, mean  $\bar{x} = 1.51$ ;  $\gamma - \alpha$  about the same as quartz; biaxial and negative, with large axial angle; no visible cleavage. Two analyses agree closely, one giving:  $\text{SiO}_2$  43.92,  $\text{Al}_2\text{O}_3$  23.68,  $\text{Fe}_2\text{O}_3$  7.37,  $\text{MgO}$  0.50,  $\text{CaO}$  2.52,  $\text{H}_2\text{O}$  22.04%. Also  $\text{FeO} = 0.60$  in a fresh sample. It loses part of its water on exposure to dry air, and regains it in moist air. A. B. PECK.

The color change in vivianite and its effect on the optical properties. THOMAS L. WARSON. Univ. Va. *Am. Mineral.* 3, 159-61(1918).—When colorless vivianite is ground it rapidly becomes blue, and chem. study has been undertaken to det. the cause of this change. The increase in depth of color, and the corresponding change in optical properties, were found to be correlated with the oxidation of  $\text{Fe}^{+2}$  to  $\text{Fe}^{+3}$ . E. T. W.

Iron as a cause of blue colors in minerals. EDGAR T. WHERRY. *Am. Mineral.* 3, 161(1918).—It is pointed out that several minerals besides vivianite (preceding abstr.) show blue colors due to the presence of both  $\text{Fe}^{+2}$  and  $\text{Fe}^{+3}$ , notably, crocidolite, iolite, and blue tourmaline or indicolite. E. T. W.

Glauberite crystal cavities in the Triassic rocks in the vicinity of Gettysburg, Pa. GEORGE W. STOSE. U. S. Geol. Survey. *Am. Mineral.* 4, 1-4(1919).—The discovery of cavities from which glauberite had dissolved out in more or less altered Triassic sedimentary rocks is described. The occurrence of this mineral is an indication as to the prevalence of arid climatic conditions during the deposition of the strata. E. T. W.

Copiapite in coal. WILLIAM J. MCCAUGHEY. Ohio State Univ. *Am. Mineral.* 3, 162-3(1918).—A specimen of fibrous melanterite in slate partings from a coal mine altered in the museum in the course of a year, becoming dull white and showing dotting with yellow particles. These agreed to a considerable extent with the mineral copiapite in optical properties, and on analysis proved to be that species. Several alleged occurrences of sulfur in coal proved to consist of the same mineral. E. T. W.

The mesosiderite-grahamite group of meteorites: with analyses of Vaca Muerta, Hainholz, Simondium, and Powder Mill Creek. G. T. PRIOR. *Mineral. Mag.* 18,





capable of depositing  $\text{CaCO}_3$  and silicates. It contains 15 mol. of water but 14 of these go off as the temp. is raised without a break in the dehydration curve, and are therefore "water of crystn.," while the last mol. (that present as OH) is driven off only at red heat. By the above graphic formulas it is implied that, although arrangement in crystals is based on geometrical rather than chem. relationships, formation in solns. of mols. with such structures led to the crystn. of the mineral in the first place. It is recommended that thaumasite be described chemically as: di-hydroxy-tricalcium carbon-silico-sulfate, crystg. with 14 mols.  $\text{H}_2\text{O}$  in the hexagonal system. In an abandoned mine near Hellertown, Pa., measurable crystals of wavellite were found. The  $n_s$ , are  $\alpha = 1.525$ ,  $\beta = 1.535$  and  $\gamma = 1.550$ , all  $\pm 0.005$ ; the sp. gr. = 2.325. Eight forms are recognized. The angles of the best developed form (121) are  $\phi = 41^\circ 45'$ ,  $\rho = 47^\circ 15'$ , whence the ratios are  $a:b:c = 0.564:1:0.404$ , differing slightly from accepted values. Analysis by Wynkoop on a small amt. gave  $\text{Al}_2\text{O}_3$  36.5,  $\text{P}_2\text{O}_5$  33.4, F (too low) 0.8,  $\text{H}_2\text{O}$  28.6,  $\text{SiO}_2$  1.1, sum, less O = F 0.3, 100.1%. This agrees with the Groth formula for the mineral, which differs from that adopted by Dana in allowing for the F and in recognizing the presence of an additional half mol. of  $\text{H}_2\text{O}$ . Written in expanded form this is  $3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 13(\text{H}_2\text{O}, 2\text{HF})$ . L. W. RIGGS.

**Ore testing.** W. B. TIMM AND C. S. PARSONS. Canada Dept. Mines, *Summary Rept.* 1917, No. 493, 63-94(1918).—This is a rept. of the testing of the following ores: Au, 2 sandstones, garnet, 4 molybdenites, W, 3 manganese, Fe, Ag, Pb, 4 chromites, and ferromolybdenum. A description of the sample, its analysis, the method and description of the treatment and conclusions drawn therefrom are given.

R. L. SIBLEY.

**Investigation of iron ores.** A. H. A. ROBINSON. Canada Dept. Mines, *Summary Rept.* 1917, No. 493, 11-23(1918).—This report is the result of an investigation of occurrences of Fe ore in Ontario. These ore deposits are for the most part titaniferous magnetites of igneous origin and derived from the magma by a process of segregation. Analyses of a large number of samples show the following results: Fe 40-50,  $\text{TiO}_2$  10-27.5,  $\text{Al}_2\text{O}_3$  2.8, CaO 1, MgO 2,  $\text{SiO}_2$  5, and P less than 0.02%; S low, with V sometimes present. It is evident that the Ti content is too high to permit the use of the Fe ores in the blast furnace, while it is too low to be regarded as a source of Ti. This Fe-bearing belt has been traced for a distance of 14 miles.

R. L. SIBLEY.

**Indian River copper deposits, Vancouver mining division.** CHARLES CAMSELL. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917 (Pt. B), 23-5(1918).—The deposits of this region all contain Cu as the principal valuable metal; it occurs as chalcopyrite, associated with pyrite and  $\text{ZnS}$ . Descriptions are given of 4 of the groups of claims. Assays of several samples of the ore average about 3% Cu with some Ag and Au.

R. L. SIBLEY.

**Explorations in Yukon Territory.** W. E. COCKFIELD. Canada Dept. Mines, Geol. Survey, *Summary Rept.* for 1917 (Pt. B), 1-9(1918).—Placer Au is the only mineral of economic value at present being produced in the Sixty-mile district. Its distribution in the gravels of the river is exceedingly widespread, but the deposits are not rich enough to work extensively. The pay-streak is nowhere very rich, and in some places runs as low as 5 to 9 cents a square foot. No W was found in any of the gravels examd.

R. L. SIBLEY.

**Economic geology of the Hazelton district.** B. C. J. J. O'NEILL. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917 (Pt. B), 9-12(1918).—There are several important Ag-Pb-Zn deposits in this district which are briefly described. Most of the deposits are of such small Ag and Au content that they cannot be profitably worked under present conditions.

R. L. SIBLEY.

**Reconnaissance along the Pacific Great Eastern railway between Squamish and Lillooet.** C. CAMSELL. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917 (Pt. B), 12-23(1918).—The geology of this portion of the western part of British Columbia is given. It was found that large bands of sedimentary and other stratified rocks lie in what was supposed to be a mass of granodiorite, thus giving conditions most favorable for the occurrence of deposits of Cu, Pb, Zn, Au and Ag. No important developments have yet been made and prospectors are urged to pay more attention to the possibilities of the coast mountains. Some small Au, Ag, and Cu deposits, Fe ore, talc and clay are briefly described.

R. L. SIBLEY.

**Investigations in the Slocan district,** B. C. M. F. BANCROFT. Canada Dept. Mines Geol. Survey, *Summary Rept.* 1917 (Pt. B), 28-41(1918).—This district includes the area in British Columbia which leads in the annual Ag production of the Province. A primary deposit of rhodonite ( $\text{MnSiO}_3$ ) is described. A secondary deposit is also mentioned. This consists of different forms of wad or bog Mn (variable,  $\text{H}_2\text{MnO}_4$ ). A sample proved to be a very good grade of wad, containing 48.14% Mn and 1.65% Fe and varying amts. of organic matter. A study of the distribution and character of the wad deposits showed them to have been formed by the deposition from mineral springs in swampy ground with little drainage. Other metals also obtained from the ores of this district are Au, Ag, Pb, Zn, Cu and Sb. Different deposits of these various metals are briefly described. Very little prospecting or mining development has been done in this district.

R. L. SIBLEY.

**Note on the occurrence of diatomaceous earth, clay and magnesite along the route of the Pacific Great Eastern Railway.** CHARLES CAMSELL. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917 (Pt. B), 25-8(1918).—A magnesite deposit which occurs in short narrow veins is described. A sample was found to contain 70  $\text{MgCO}_3$ , 27  $\text{CaCO}_3$  and 2% Fe. The material was not affected by heat up to 1600° C., but contains too much Ca to be of commercial use. Some clay beds are also described, and a deposit of diatomaceous earth which overlies one of them. It is white or grayish, very light and will float before it absorbs water. Analysis showed  $\text{SiO}_2$  76.2, loss on ignition 10.8, and residue 13.0%. This material can be used for the manufacture of insulating brick when mixed with 20% of clay and some sawdust and burned.

R. L. SIBLEY.

**Limestones of Ontario.** HOWELLS FRÉCHETTE. Canada Dept. Mines, *Summary Rept.* 1917, No. 493, 23-48(1918).—A total of 126 analyses of samples of limestone are reported as to their content of insol. mineral matter,  $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CaCO}_3$ ,  $\text{MgCO}_3$ , CaO equiv., and MgO equiv. These samples were collected from different quarries in the various counties of Ontario. A sample of marl was tested without previous laboratory grinding and gave 35.1% fine whiting, and 43.9% of coarse whiting, both of which are of a fineness suitable for commercial use. Most of the marls dry to a light cream color, but some give an almost pure white product.

R. L. SIBLEY.

**Non-bituminous road materials.** L. REINECKE. *Econ. Geol.* 13, 557-97(1918).—This paper is intended as an introduction to the study of non-bituminous road materials and describes the field and lab. tests applied to bed rock, glacial boulder, and gravel deposits and the relative values of the tests in each division.

A. B. PECK.

**The basaltic rocks of the Arctic region.** ARTHUR HOLMES. *Analyses.* H. F. HARWOOD. *Mineral. Mag.* 18, 180-223(1918).—A petrographical and chem. investigation of the rocks of Hare Island, West Greenland; Scoresby Sound, East Greenland; Iceland, Faroe Islands, Jan Mayen, Spitzbergen, and Franz Josef Land. The rocks have approx. equal amts. of salic and femic minerals except in the porphyritic rocks of Scoresby Sound and Spitzbergen where salic dominates. Alkalies are subsidiary to

lime and of the alkalis soda is always predominant. The outstanding chem. features are low  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and alkalis, and high  $\text{TiO}_2$ ,  $\text{Fe}_2\text{O}_3$ , and  $\text{CaO}$ .  $\text{V}_2\text{O}_5$  is present in greater amt. than  $\text{Cr}_2\text{O}_3$  and is probably a constituent of the pyroxenes.  $\text{TiO}_2$  is present mainly as ilmenite or titaniferous magnetite and to some extent in the pyroxenes of the saturated rocks. Among the saturated rocks those with porphyritic plagioclase contain less  $\text{TiO}_2$  than those without phenocrysts.  $\text{NiO}$ ,  $\text{Cr}_2\text{O}_3$ , and  $\text{V}_2\text{O}_5$  were estd. in one sample by the following method: 5 g. were treated in Pt dish with  $\text{H}_2\text{SO}_4$  and  $\text{HF}$  and evapd. until the  $\text{H}_2\text{SO}_4$  fumed strongly; digested with hot  $\text{H}_2\text{O}$  and filtered. The residue was ignited, fused with  $\text{Na}_2\text{CO}_3$ , and the melt dissolved in dil.  $\text{H}_2\text{SO}_4$  and added to the previous soln. Br water was added to oxidize Fe and the excess removed by boiling;  $\text{NH}_4\text{OH}$  was added, and both Cr and V pptd. The combined ppt. was fused in a Ni crucible with  $\text{NaOH}$  and  $\text{Na}_2\text{O}_2$ , the melt extracted with  $\text{H}_2\text{O}$  and the V and Cr estd. by Hillebrand's method (pptn. with  $\text{HgNO}_3$ ). The Ni is estd. in the filtrate with dimethylglyoxime.

WALTER F. HUNT.

Silicate specific heats (WHITE) 2.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Why minerals float. GEO. J. YOUNG. *Eng. Mining J.* 106, 1127-8(1918).—The formation of a froth is due to conditions which permit flocculation, to the occlusion (adsorption) of O by both the mineral particles and the oily particles, and to the presence of an oily substance in which there is a colloidal suspension. The adsorption of O by the sulfide minerals and the oil is due to the fact that they are oxidizable substances. Flocculation may be brought about by the use of suitable electrolytes, by heat or by discharge of charged particles in suspension.

E. SCHRAMM.

Collective and preferential flotation. GUY C. RIDDELL. *Chem. Met. Eng.* 19, 822-5(1918).—The use is described of the Bradford  $\text{SO}_2$  process at the slimes plant of the Broken Hill Proprietary Co. in Australia. A notable feature of the operation at this plant is that no oil or other org. emulsifying agent is employed. Experience at Broken Hill has demonstrated the desirability of violent agitation for the Bradford process. It is pointed out that the difference between the Bradford process and other preferential processes is that it effects a positive wetting of the blende, i. e., a removal of the gaseous envelope. The advantages of lab. control are emphasized and the points to be particularly watched are enumerated.

E. SCHRAMM.

Annual review on the various metals, metal products, ores and other minerals for 1918. *Eng. Mining J.* 107, No. 2(1919) cf. C. A. 12, 464.—This whole number (96 pp.) is devoted to statistics by various authors relating to production, trade, prices, mining, etc. The field is covered with considerable thoroughness. A few of the reviews of a bit more chem. interest than the others are: "Lead products other than white lead," by J. R. WERTSTEIN; "New mining and metallurgical construction in 1918;" "The tungsten industry in 1918," by GEO. J. YOUNG; "Ferro-alloys in 1918," by ROBERT J. ANDERSON; "Metallurgy of quicksilver," by MURRAY INNES; "Metallurgy of zinc," by W. R. INGALLS; "Metallurgy of lead," by H. O. HOFMAN; "Metallurgy of copper," by ARTHUR L. WALKER; "Metallurgy of gold and silver," by A. W. ALLEN; "The flotation process," by A. W. ALLEN; "Notes on ore dressing," by A. W. ALLEN; "Uncommon ores and metals," by H. C. MEYER; and "Pyrite, sulfur and sulfuric acid."

E. J. C.

Copper, lead, gold and silver ores. C. H. FULTON. *Metal Record and Electro-Plater* 4, 274-6(1918).—A review.

C. G. F.

**Molybdenum within the (British) Empire.** SYDNEY J. JOHNSTONE. *J. Soc. Chem. Ind.* 37, 448-50R(1918). E. H.

**Powdered coal for igniting D. and L. roasters.** ANON. *Chem. Met. Eng.* 19, 797(1918).—An app. is described which has been successfully tried at the Midvale Smelter of the United States Smelting, Refining and Mining Co. E. SCHRAMM.

**Melting the non-ferrous metals.** CARL HERRING. *Metal Record and Electroplater* 4, 271-2(1918).—See C. A. II, 2070. C. G. F.

**Unique features of an Illinois foundry.** CHARLES LUNDBERG. *Iron Age* 102, 1563-9(1918).—A description of practice at the foundry of the Avery Co., Peoria, Ill., including operation of a  $1\frac{1}{2}$ -ton Booth-Hall elec. furnace. In the latter it has been found best to carry the magnesite lining to the roof. Shank ladles into which the metal is tapped are brought almost to a white heat by an oil heater, giving a clean pour. The foundry is continuously operated and is designed for large production in small space. In the molding room molds are made on machines at the outer edge of a circle, and then pushed toward the center and out of the way of the molder. The circle thus used accommodates 60-70 molds. A. BUTTS.

**Removing foundry dust by electrical precipitation.** H. D. EGBERT. *Foundry* 47, 43-5(1919).—E. describes an application of the Cottrell process of elec. pptn. to the treatment of dusty air from tumbling barrels in an iron foundry. The recent tendency in elec. pptn. work is to collect electrode tubes of smaller diam. to obtain better efficiency with a lower operating voltage. To secure uniform distribution of the dusty air among the collecting electrode pipes the air is admitted some distance above the bottom of the pipes so that it passes down around these, then up between the electrodes, thence to the top header and to the open air. The precipitator consists of three sections, each with 36 collecting electrode pipes 8 in. in diam. by 15 ft. long. One set of elec. equipment furnishes the current for all three pptg. sections. Advantages claimed for the process are: satisfactory collection of dust; elimination of danger of fire by sheet metal construction, when necessary; and ability to treat the gases at any temp. up to 538°. W. H. BOYNTON.

**A small open-hearth furnace.** EDWIN BOSSHARDT. *Iron Age* 102, 1458(1918).—The furnace is of German design. It is of 2 metric tons' capacity, and is fired by two producers of the Siemens type built as a part of the furnace (one at each end). There are gas and air regenerators; and the reversing valves are so constructed that the gas from the producer at the exit end is passed over to the inlet port at the other end. It is claimed that a temperature of 2000° is reached. It is used for making steel castings from scrap. The fuel consumption claimed is 1 lb. coal per lb. scrap when melting 2 charges per day; or  $\frac{1}{2}$  lb. coal on 4 charges per day. W. L. BADOER.

**Manganese-alloy furnaces.** P. H. ROYSTER. *Iron Age* 102, 1607(1918).—Poor quality of coke used for blast furnaces producing ferro-Mn and spiegeleisen causes serious waste of both Mn and coke. Since the principal loss of Mn is due to the slag and is roughly proportional to the vol. of the slag, a low-ash coke is required. Figures are given, based on the actual statistics of the Mn industry, showing that there would be an enormous saving if coke with 8% ash were allocated to the Mn-alloy furnaces; and also that there would not be a corresponding handicap to the production of pig Fe, except that more furnace capacity would be needed. A. BUTTS.

**Effective tube-mill liners.** A. W. ALLEN. *Eng. Mining J.* 106, 867(1918).—An example of the difficulties met when liners do not fit closely the surface they are supposed to protect. A tube mill with dished heads was provided with flat head liners and cylindrical trunnion liners, meeting in a sharp right angle and leaving considerable space between the flat liner and the dished head. The angle where the trunnion liner

met the head liner soon wore off, sand entered the space, and finally resulted in failure and collapse of the mill. New liners were made with a smooth rounded throat opening into the trunnion, making a smooth joint with the trunnion liners. The dead space behind the liners was filled with tightly fitted wood blocks, which swelled to fill the space tightly. This arrangement was extremely satisfactory. W. L. BADGER.

**The Berdan pan for amalgamation.** A. W. ALLEN. *Eng. Mining J.* 106, 1075-6 (1918).—The pan is a circular cast-Fe trough turning with a revolving shaft at its center at a speed of 10-5 r. p. m. It is tilted so that material fed in will flow out gradually at the lower part of the lip. The trough contains a 120-lb. steel ball, which rolls in a pool of Hg. Fine ore revolving under the ball is ground and amalgamated. The pan has too small a capacity for use as a unit of milling equipment, but is effective and simple for small operations, clean-ups, and many special uses. It requires very little power. The Hg is not floured. A. BUTTS.

**Zinc-box practice.** A. W. ALLEN. *Eng. Mining J.* 106, 1017-21 (1918).—Due to fluctuation in the grade of cyanide soln., automatic feed adjustment in the addition of a precipitant is ordinarily impracticable; the precipitant must be added in excess to avoid danger of imperfect pptn. When a base metal is used as the precipitant, excess fouls the ppt. and it may be necessary to introduce a refining plant to remove the excess from it. This is not justified in the smaller plants, and the use of Zn shavings has the advantage over dust in that the shavings can be screened off. A combination of dust for the bulk of the pptn. and shavings for the finishing can be used. With Ag cyanidation coarse shavings,  $\frac{1}{400}$  in. thick, can be used and returned to the Zn boxes after screening off. With Au  $\frac{1}{750}$ -in. shaving is better, and the excess is roasted or acid-treated. Cloudy soln. is a source of trouble; it should be clarified by a press required to handle only the finest material. Extra Zn boxes over the required capacity will simplify operation and clean-up. When the barren soln. begins to gain in metal content an additional box may be packed with Zn; addition of boxes in this manner avoids much dressing. Fresh Zn should not be added in the first compartment before the clean-up, but the attacking action of the soln. should be concentrated there on short Zn and the sludge removed in a concentrated form. Boxes with level bottoms, no means of drainage, or inaccessible parts, are to be avoided. Suggestions for the clean-up are given, and also methods of computing the rate of flow of soln. through the boxes, which must be carefully regulated to save both cyanide and Zn.

A. BUTTS.

**Innovations in the metallurgy of lead.** DORSEY A. LYON AND OLIVER C. RALSTON. *Bur. of Mines, Bull.* 157, 169pp. (1918).—The application of new hydrometallurgical and other methods has been made to the following ore types, (a) oxidized lead ores, (b) oxidized lead ores containing precious metals, (c) oxidized Pb and Zn ores, (d) simple sulfide ores of Pb, (e) leady Zn concentrates, (f) Pb-Fe sulfide middlings, (g) complex sulfide ores of Pb, Zn, Fe and Cu with or without precious metals. Three alternative methods have been tested in treatment of material containing oxidized Pb, as follows: sulfidizing and flotation, acid brine leaching of the raw material, and volatilization of the Pb with the recovery of the lead chloride fume. For the non-oxidized ores of Pb the Pb may be removed by chloridizing roasting with volatilization or subsequent leaching. E. SCHRAMM.

**Reconstruction in the zinc industry.** J. A. SINGMASTER. *J. Ind. Eng. Chem.* 11, 146-7 (1919).—It is believed that "the chief role of chem. and phys. science in this period of reconstruction will be along quality lines." E. J. C.

**The elimination of gelatinous silica in the hydrometallurgy of zinc.** F. LAIST. *Eng. Mining J.* 106, 1117-8 (1918).—The silica is pptd. in the presence of ore pulp by

addition of calcine, limestone and zinc duct and filtered but not washed. It is then dried at about 150°. This primary filter cake is leached with acidified soln. and the resulting pulp filtered, leaving a granular silica residue which is comparatively free from zinc.

E. SCHRAMM.

Condensing quicksilver from furnace gases. L. H. DUSCHAK AND C. N. SCHURTER. *Mining Sci. Press* 117, 315-23; *Bur. of Mines Tech. Paper* 209.—Investigations were made of the amt. of Hg escaping from the condenser systems at the New Idria and the Oceanic mines in California, the work being conducted through the Bur. of Mines Expt. Station at Berkeley. The plants have Scott furnaces followed by brick condensers, then wooden tanks, barrels, and flues leading to the stacks. The gases contain a large amt. of water-mist. Samples were withdrawn through a glass tube 0.15 in. inside diam. and drawn through a Liebig condenser, a water-cooled bead-tower, a Hawley filter, a wash-bottle containing NaOH for removal of CO<sub>2</sub> and SO<sub>2</sub>, and a small gas-meter. Aspiration was by a water-jet pump. Samples were of 100-500 l. Gas velocity in the flues was detd. by injecting H<sub>2</sub>S at the lower end and detecting its appearance at the end of a measured length by drawing a sample of the gas through Pb(OAc)<sub>2</sub> soln. This detn. of gas vol. checked the vol. as calcd. from the furnace C-consumption and the gas CO<sub>2</sub>-content. To the amt. of condensed Hg collected there was added a correction for uncondensed vapor as calcd. from the vapor tension of Hg at the mean temp. of the Liebig condenser and the bead-tower. Results showed a total loss of 0.04 to 0.12 g. of Hg per cu. m. of dry gas at standard conditions, or 1% of the Hg input at the New Idria and 2% at the Oceanic. Water escaping from a condenser system carries Hg either as metallic particles or as salts in soln. Other sources of loss are by gas leakage in case of insufficient draft, by absorption into the walls, and mechanical losses from leaks and spattering. A slight in-draft should be present in all parts of the system to avoid danger of serious loss. These latter sources of loss, which cannot be measured, are usually large; the measured losses are small. The larger losses can be avoided, so that a condenser efficiency of at least 96-9% should be attained.

A. BUTTS.

Metallography of aluminium. ROBERT J. ANDERSON. *J. Franklin Inst.* 187, 1-47(1919).—Sections are devoted to: The amorphous theory and plastic deformation, observations on grain growth phenomena, internal structure of cast Al, annealing and recrystallization of cold-worked Al, exaggerated grain growth in deformed Al, slip bands in Al, polishing and etching Al, bibliography (61 references cited).

JOSEPH S. HEPBURN.

Annealing aluminium. ANON. *J. Ind. Eng. Chem.* 11, 155(1919).—Prolonged annealings are harmful, rendering the metal coarse and weak. The results of tests show that there is no necessity for annealing at 375° for 24 hrs., as is common practice.

W. T. H.

A study of the joining of metals. J. A. CAPP. *Gen. Elec. Rev.* 21, 947-56(1918).—A report of an investigation of the metallurgical aspect of butt welding and the effect of (1) high current applied for a relatively long time, (2) a smaller current applied for a shorter time and (3) a current just high enough to produce a welding temp. in a minimum length of time. A complete set of micrographs shows conclusively that the degree of excellence of the weld increases with the current condition in the order given. Welds may be made by the Thompson process, so that the metal is structurally the same in the weld as in the areas away from the influence of the weld. The conditions under which such results may be obtained are that the surfaces in contact and the metal in the immediate vicinity be heated no higher than in ordinary forge welding. The time should be brief and the pressure enough to force contact and very slight deformation. Welds made under conditions favoring a heavy "flash" are unreliable and

of necessity weaker than the original metal, since a flash is accompanied by decarbonization and blowholes. W. E. RUDER.

Lead, tin and antimony alloys. O. W. ELLIS. *Metal Record and Electroplater* 4, 277-81(1918).—See C. A. 12, 1285. C. G. F.

Cupro-nickel. T. H. A. EASTICK. *Metal Ind.* 17, 26-8(1919).—The equilibrium diagram, the physical properties, structure and metallographic characteristics of Cu-Ni alloys are described. W. T. HALL.

An example of crystal crushing. ANON. *Chem. Met. Eng.* 20, 72(1919).—After a tensile strength test of shell steel, the fractured surface shows a crystalline structure except at about the center which often has a silky appearance. This appears to be due to a crushing of crystals during the stretching of the bar before rupture.

W. T. H.

The value of observation in works practice. H. H. ASHDOWN. *Engineering* 107, 11-4(1919).—Habits of observation, such as we attempt to teach students of chemistry, are shown to be of value in practical work with metals. The value of proper correlation between scientific and practical work is urged. W. T. H.

Micro-metallographic illumination. HENRY M. SAWYER. *Engineering* 106, 729-30(1919).—The methods of illumination for microscopic work with metals are discussed and tests described for obtaining the best results. W. T. H.

The inspector's standpoint in munition production. JOHN T. MARSH. *J. Cleveland Eng. Soc.* 11, 131-52(1918).—Actual observations on materials from which munitions of war were to be made are described. Whether defective material, such as an ingot of steel, is the result of blundering, ignorance, criminal negligence or intentional criminal action cannot be detd. Among other examples, the results of a premature explosion in a 4.5 howitzer gun are shown. The value of the defective shell which caused terrific damage, at a stage where its weakness could have been detected, was only \$2. This case is cited to show that the value of rejected material is something that an inspector cannot take into consideration. W. T. HALL.

The occlusion of gases in metals. ANON. *Nature* 102, 234(1918).—A digest of a symposium held at the Faraday Society on the occlusion of gases in steel, Ag, Cu and other metals. Cf. C. A. 13, 220. W. H. ROSS.

On the rate of change at 100° and at ordinary temperatures in the electrical resistance of hardened steels. E. D. CAMPBELL. *Electrician* 82, 17-8(1919).—See C. A. 12, 129, 268. C. G. F.

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Electrolytic pickling of steel (HERING) 4. Leaching and filtration nomenclature (ALLEN) 18.

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CALDWELL, JAMES: Report to the United States Shipping Board Emergency Fleet Corporation on Electric Welding and Its Application in United States of America to Ship Construction. Philadelphia: Emergency Fleet Corporation. 418 pp.

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Concentrating ores. O. WISER. U. S. 1,288,350, Dec. 17. Ores which may contain Cu, Zn or other metals, are subjected to a flotation sepn. in a bath containing H<sub>2</sub>O, Na resinate and oil. Na<sub>2</sub>S may also be added to facilitate sepn. of mixed Cu ores.

Reducing ores containing iron and manganese. J. T. JONES. U. S. 1,288,422, Dec. 17. An ore containing Fe and Mn, pulverized to 20-100 mesh, is mixed with coal pulverized to the same fineness and the mixt. is heated out of contact with air to about 1100° to coke the coal and reduce the Fe to metal. The reduced Fe is sepd. from the



coked material and the residue is then heated to about 1650° in the presence of air to reduce the Mn to metal.

**Treating gold ores.** J. PENHALE and W. H. TRELOAR. Brit. 120,287, Dec. 3, 1917. Au ores are freed from sulfides of Sn and As by crushing and sliming in an aq. soln. of alkali metal sulfides. After filtration, the Sb and As sulfides may be pptd. from the resulting soln. by means of acid.

**Treatment of zinciferous ores.** P. M. GILLIES. Can. 188,033, Dec. 31, 1918. Complex sulfide ores are treated after roasting and crushing with  $H_2SO_4$  to dissolve the ZnO, the  $ZnSO_4$  soln. is then purified with  $H_2S$  and electrolyzed.

**Continuous isolation of zinc or lead.** E. A. JOHANSSON. Swed. 44,072, May 22, 1918. The ore is treated successively in two communicating furnaces arranged in such manner that only the fused charge can pass through the communicating channel. In the first furnace the charge is fused and purified, with the addition of fluxes if necessary, while the reduction is effected in the second furnace.

**Extracting copper from ores.** H. W. MORSE. U. S. 1,288,121, Dec. 17. Ore containing cuprite together with other oxidized Cu minerals and Cu sulfide is treated with dil.  $H_2SO_4$  to sep. part of the Cu of the cuprite as metallic Cu and to dissolve another part of the cuprite together with Cu of the other minerals present. The resulting pulp is subjected to flotation to sep. the metallic Cu and sulfide values from it and the dissolved Cu is then pptd. *e. g.*, by the action of scrap Fe, and the metallic Cu and remaining Cu sulfide is then recovered from the resulting pulp by flotation.

**Recovery of metals from slags.** J. B. HERRESHOFF. Brit. 117,470, Apr. 14, 1917. See Can. 181,246 (C. A. 12, 578).

**Refining zinc.** S. HULDT. Can. 188,176, Jan. 7, 1919. Zn containing Pb is refined by providing a molten bath having a vaporizing surface properly proportioned to its depth so that the Pb will not be vaporized. The bath constitutes a heat magazine for counterbalancing variations of temp.

**Refining zinc.** G. C. FRICKER. U. S. 1,287,949, Dec. 17. Vapor from impure Zn is passed through a filter of foundry coke or other inert material which is so placed as to float upon the charge of molten Zn undergoing refining and completely to cover its surface. The coke retains impurities and thus separates them from the Zn.

**Smelting furnaces or cupolas.** A. POULSON. Can. 188,472, Jan. 28, 1919. The furnace comprizes a chamber surrounding the cupola, a series of tuyère holes leading from the chamber tangentially into the furnace and a jacket surrounding the blast inlet to the chamber, to which jacket a portion of the hot gases from the cupola is led.

**Rust-proofing iron or steel.** W. H. ALLEN. U. S. 1,287,605, Dec. 17. A soln. for treating Fe or steel to prevent rust is formed of  $Na_2Cr_2O_7$ ,  $H_3PO_4$  and  $H_2O$ . Other chromates or dichromates or manganates or permanganates may also be used.

**Chrome-steel.** C. H. WILLS. U. S. 1,288,344, Dec. 17. A case-hardening steel is formed of the usual constituents with the addition of about 1% or less of Mo which renders it possible to accomplish refining of the case and core simultaneously. The steel may, *e. g.*, contain C 0.06–0.18%, Mn 0.20–0.75%, Cr 0.75%, Si 0.10–0.40% and Mo 1% or less.

**Spring-steel.** C. H. WILLS. U. S. 1,288,345, Dec. 17. A "heavy-duty" spring steel is formed containing C 0.38–0.55%, Mn 0.40–1.25%, Cr 2% or less, Si 0.10–0.40% and Mo 1% or less. The steel preferably is drawn at a temp. of about 570°.

**Utilizing sulfuric acid pickle liquors.** P. FIREMAN. U. S. 1,287,939, Dec. 17. The free  $H_2SO_4$  in pickle liquor such as has been used for pickling Fe or steel is neutralized with scrap Fe or CaO, the resultant  $FeSO_4$  soln. is treated with  $CaCl_2$  and the

$\text{FeCl}_3$  soln. so obtained (after removal from the ppt. of  $\text{CaSO}_4$ ) is treated with  $\text{Ca}(\text{OH})_2$  to regenerate the  $\text{CaCl}_2$  and produce a ppt. of  $\text{Fe}(\text{OH})_3$ .

**Composition for making follow boards and patterns used in founding.** F. S. KNAPPER. U. S. 1,288,035, Dec. 17. A mixt. for making patterns is formed of sand 50, cement 3, graphite 3,  $\text{PbO}$  1 part and sufficient linseed oil or other vegetable oil to form a plastic mass. Patterns formed of this material are preferably coated with shellac.

**Crude cyanides.** HORACE FREEMAN. Can. 188,258, Jan. 14, 1919. A compn. containing 20% of an alkali metal cyanide mixed with an alkali metal chloride, an alk. earth chloride,  $\text{CaO}$  and  $\text{C}$  is used in the extn. of  $\text{Au}$  from its ores.

**Phosphorus-copper alloy.** P. E. DEMMLER. U. S. 1,287,653, Dec. 17.  $\text{Cu}$  is heated to a temp. somewhat below its m. p., preferably about  $400^\circ$ , and vapors of  $\text{P}$  are then allowed to combine with it.  $\text{P}$  and  $\text{Zn}$  or  $\text{Sn}$  may be similarly combined.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

**Polyhydric mercaptans of the benzene series.** VI. Homologous dithiolbenzenes. J. POLLAK AND B. SCHADLER. *Monatsh.* 39, 129-48 (1918); *J. Chem. Soc.* 114, I, 497-8. —By treatment with fuming  $\text{H}_2\text{SO}_4$ , *m*-xylene was converted into a mixture of disulfonic acids, from which by the action of  $\text{PCl}_5$  a mixt. of the corresponding *m*-xylene-2,4- and -2,5-disulfonyl chlorides was obtained. The cryst. 2,4-chloride, on reduction with  $\text{Sn}$  and  $\text{HCl}$ , gave 2,4-dithiol-*m*-xylene,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SH})_2$ , leaflets, m.  $123-5^\circ$  (acetyl derivative,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SAc})_2$ , leaflets, m.  $76.5-79^\circ$ ), which reacts with  $\text{ClCH}_2\text{CO}_2\text{H}$  and  $\text{ClCO}_2\text{Et}$ , resp., in alk. soln., yielding *m*-xylene-2,4-dithiolacetic acid,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SCH}_2\text{CO}_2\text{H})_2$ , stellar aggregates, m.  $185-9^\circ$ , and 2,4-diethylthiocarbonato-*m*-xylene,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SCO}_2\text{Et})_2$ , long needles, m.  $61-3^\circ$ , and is converted by aq.  $\text{H}_2\text{O}_2$  into a substance,  $(\text{C}_6\text{H}_2\text{Me}_2\text{S}_2)_n$ , needles, m.  $252-5^\circ$ ; with picryl chloride the mercaptan reacts, producing 2,4-dipicrylthiol-*m*-xylene,  $\text{C}_6\text{H}_2\text{Me}_2[\text{SC}_6\text{H}_2(\text{NO}_2)_3]_2$ , orange needles with 1  $\text{C}_6\text{H}_4$ , m.  $258-9.5^\circ$ . Treatment with  $\text{Me}_2\text{SO}_4$  in the presence of alkali converts the mercaptan into 2,4-dimethylthiol-*m*-xylene,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SMe})_2$ , needles, m.  $83-84.5^\circ$ , which reacts with  $\text{Cl}$ , yielding a substance  $\text{C}_{10}\text{H}_{11}\text{S}_2\text{Cl}$  and with  $\text{Br}$  in  $\text{CHCl}_3$  soln., giving an additive compound,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SMe})_2\text{Br}_2$ , deep red needles, decomp.  $99-102^\circ$ ; this regenerates the parent substance when shaken with aq.  $\text{NaHSO}_3$  in  $\text{CHCl}_3$ . Oxidation with aq.  $\text{KMnO}_4$  converts the di-Me deriv. into the disulfone,  $\text{C}_6\text{H}_2\text{Me}_2(\text{SO}_2\text{Me})_2$ , needles, m.  $187-8^\circ$ . In a similar manner, the isomeric oily 1,3,2,5- $\text{C}_6\text{H}_2\text{Me}_2(\text{SO}_2\text{Cl})_2$  can be reduced to an oily 2,5-dithiol-*m*-xylene, b.  $142-4^\circ$ , which reacts with  $\text{ClCH}_2\text{CO}_2\text{H}$  in alk. soln., giving *m*-xylene-2,5-dithiolacetic acid, stellar aggregates, m.  $158-61^\circ$ , and with picryl chloride forming 2,5-dipicrylthiol-*m*-xylene, crystals, m.  $211-3^\circ$ . The 2,5-dimethylthiol-*m*-xylene, b.  $167-9^\circ$ , obtained by methylation with  $\text{Me}_2\text{SO}_4$ , undergoes substitution when treated with  $\text{Br}$  in  $\text{CHCl}_3$ , yielding a bromo derivative,  $\text{Me}_2\text{C}_6\text{H}_2\text{Br}(\text{SMe})_2$ , cryst. scales, m.  $122-3^\circ$ . The unexpected greater ease of bromination of this compd. led to a doubt as to whether the relative structures of these substances are really as assumed above, but an attempt to decide this matter by heating the 2,4-disulfonyl chloride with  $\text{SOCl}_2$  in the hope of replacing the  $-\text{SO}_2\text{Cl}$  groups by  $\text{Cl}$  atoms was unsuccessful, the product being a substance,  $\text{C}_6\text{H}_2\text{O}_2\text{Cl}_4$ , cryst. scales, m.  $76-7^\circ$ , possibly 2,4,1,3- $\text{C}_6\text{H}_2\text{Cl}_4(\text{COCl})_2$ . A somewhat similar reaction to this was observed between 1,3,4,6- $\text{C}_6\text{H}_2(\text{OMe})_2(\text{SO}_2\text{Cl})_2$  and  $\text{SOCl}_2$  at  $170^\circ$ , the product being a substance,  $\text{C}_6\text{H}_2\text{O}_2\text{Cl}_4$ , needles, m.  $95-8^\circ$ , possibly of the structure  $\text{C}_6\text{H}_2\text{Cl}_4(\text{OCH}_2\text{Cl})_2$ , 2,6(?)-Dithiol-*p*-xylene, b.  $145.5^\circ$  (diacetyl derivative, needles, m.  $79.5-82.5^\circ$ ; *p*-xylene-

2,6-dithiolacetic acid, needles, m. 170.5–4.5°; *picryl derivative* yellow cryst. solid, m. 251–5°; *dimethyl derivative*, needles, m. 92–4°) is obtainable from *p*-xylene through the disulfonyl chloride. VII. Substituted thiolbenzenes. *Ibid* 39, 179–200(1918); *J. Chem. Soc.* 114, I, 498–500.—The effect of the introduction of a Me group on the m. p. of the polyhydric mercaptans is rather irregular; thus, 1,3-dithiolbenzene and 2,4-dithiol-*m*-xylene, m. 25° and 121°, resp., whereas the substitution of a Me group into the nucleus of trithiolbenzene causes a small depression of the m. p. Further compds. were therefore prepd. with the view of investigating the influence of such substitution more widely, but no general regularities were observed either with the m. p. or b. p. 1-Ethylbenzene-2,4-disulfonic acid (barium salt, crystals with 2.5 mols. H<sub>2</sub>O), obtained by the action of fuming H<sub>2</sub>SO<sub>4</sub> on C<sub>6</sub>H<sub>5</sub>Et, was converted into the corresponding acid chloride C<sub>6</sub>H<sub>4</sub>Et(SO<sub>2</sub>Cl)<sub>2</sub>, by the action of PCl<sub>5</sub> on its sodium salt at 140–50°; the corresponding 1-ethylbenzene-2,4-disulfonamide, C<sub>6</sub>H<sub>4</sub>Et(SO<sub>2</sub>NH<sub>2</sub>)<sub>2</sub>, m. 186–90°, was obtained by the action of warm aq. NH<sub>3</sub> upon the chloride. On reduction with Sn and HCl, the acid chloride is converted into 2,4-dithiol-1-ethylbenzene, C<sub>6</sub>H<sub>4</sub>Et(SH)<sub>2</sub>, an oil, b<sub>15–20</sub> 150–2°, which reacts with alk. Me<sub>2</sub>SO<sub>4</sub>, yielding 2,4-dimethylthiol-1-ethylbenzene, C<sub>6</sub>H<sub>4</sub>Et(SMe)<sub>2</sub>, a pale yellow oil, b<sub>14</sub> 171–3°, while with ClCO<sub>2</sub>Et, and ClCO<sub>2</sub>Me in the presence of alkali the products are the colorless 2,4-diethylthiocarbonato-1-ethylbenzene, C<sub>6</sub>H<sub>4</sub>Et(SCO<sub>2</sub>Et)<sub>2</sub>, b<sub>14</sub> 224–6°, and the corresponding 2,4-dimethylthiocarbonato-1-ethylbenzene, b<sub>18</sub> 217–20°, resp. The dithiol compd. also reacts with ClCH<sub>2</sub>CO<sub>2</sub>H in the presence of alkali and with picryl chloride, yielding, resp., 1-ethylbenzene-2,4-dithiolacetic acid, crystals, m. 137–40°, and 2,4-dipicrylthiol-1-ethylbenzene, C<sub>6</sub>H<sub>4</sub>Et[SC<sub>6</sub>H<sub>3</sub>(NO<sub>2</sub>)<sub>3</sub>]<sub>2</sub>, yellow needles, m. 197.5–99°. When heated with AcONa and Ac<sub>2</sub>O, the dithiol compound is converted into the diacetyl derivative, b<sub>18</sub> 218–20°, and in the presence of alc. NH<sub>3</sub> is oxidized by concd. H<sub>2</sub>O<sub>2</sub> with the formation of the substance (C<sub>6</sub>H<sub>4</sub>EtS<sub>2</sub>)<sub>n</sub>. HNO<sub>3</sub> in the cold converts 2,4-(MeS)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>Et into 5-nitro-2,4-dimethylthiol-1-ethylbenzene, NO<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Et(SMe)<sub>2</sub>, yellow, silky needles, m. 117–8°, whereas fuming HNO<sub>3</sub> effects an oxidation to a monosulfoxide of the last product, NO<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Et(SMe)SMeO, yellow, silky needles, m. 119.5–20.5°. In a similar manner to the preceding *p*-EtC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Cl was made to yield 4-thiol-1-ethylbenzene, C<sub>6</sub>H<sub>4</sub>EtSH, b<sub>17–18</sub> 91–3° (acetyl derivative, C<sub>6</sub>H<sub>4</sub>EtSAC, b<sub>17–18</sub> 136.5–40°), which in alk. soln. reacts with ClCH<sub>2</sub>CO<sub>2</sub>H, giving 1-ethylbenzene-4-thiolacetic acid, C<sub>6</sub>H<sub>4</sub>EtSCH<sub>2</sub>CO<sub>2</sub>H, silky needles, m. 61–7°, and in alc. soln. with picryl chloride, forming 4-picrylthiol-1-ethylbenzene, deep yellow, silky needles, m. 113.5–6°. By treating phenol with fuming H<sub>2</sub>SO<sub>4</sub>, a mixt. of sulfonic acids can be obtained which, on conversion into the corresponding Na or K salts and heating with PCl<sub>5</sub> at 140–50°, yields a more sol. (in Et<sub>2</sub>O) 4-chlorobenzene-1,3-disulfonyl chloride, ClC<sub>6</sub>H<sub>3</sub>(SO<sub>2</sub>Cl)<sub>2</sub>, needles, m. 87–8°, and a less sol. 2-chlorobenzene-1,3,5-trisulfonyl chloride, C<sub>6</sub>H<sub>2</sub>Cl(SO<sub>2</sub>Cl)<sub>3</sub>, pale yellow needles, m. 170–1°. The former product, on reduction with Sn and HCl, gives 4-chloro-1,3-dithiolbenzene, C<sub>6</sub>H<sub>3</sub>Cl(SH)<sub>2</sub>, pale yellow liquid, b<sub>17–18</sub> 145–6° (acetyl derivative, C<sub>6</sub>H<sub>3</sub>Cl(SAC)<sub>2</sub>, b<sub>18</sub> 214–7°; picryl derivative, golden yellow platelets, m. 201–2°; dimethyl derivative, pale yellow oil, b<sub>18</sub> 177–9°); 4-chlorobenzene-1,3-dithiolacetic acid, C<sub>6</sub>H<sub>3</sub>Cl(SCH<sub>2</sub>CO<sub>2</sub>H)<sub>2</sub>, silky needles, m. 159–60°; the reaction with ClCO<sub>2</sub>Et followed an unusual course, the product under normal conditions consisting of 4-chloro-3(?)thiol-1(?)ethylthiocarbonato-benzene, HSC<sub>6</sub>H<sub>3</sub>ClSCO<sub>2</sub>Et, b<sub>18</sub> 204°, the completely substituted 4-chloro-1,3-diethylthiocarbonatobenzene, C<sub>6</sub>H<sub>3</sub>Cl(SCO<sub>2</sub>Et)<sub>2</sub>, needles, m. 48–9°, being obtained only with the use of an excess of ClCO<sub>2</sub>Et. The reduction of 2,1,3,5-C<sub>6</sub>H<sub>2</sub>Cl(SO<sub>2</sub>Cl)<sub>3</sub> gave 2-chloro-1,3,5-trithiolbenzene, yellow crystals, m. 64–67°; methyl derivative, C<sub>6</sub>H<sub>3</sub>Cl(SMe)<sub>3</sub>, needles, m. 92–4°; 2-chlorobenzene-1,3,5-trithiolacetic acid, needles, m. 199–200°.

C. J. WEST.

Tetramethyl-3,3'-diaminodiphenylmethane. ROLAND SCHOLL and JOS. LENKO. *Monatsh.* 39, 236–7(1918); *J. Chem. Soc.* 114, I, 506.—When heated with MeI and

MeOH at 140–50°, ( $m\text{-H}_2\text{NC}_6\text{H}_4$ )<sub>2</sub>CH<sub>2</sub> is converted into the *methiodide*,  $\text{C}_{16}\text{H}_{20}\text{N}_2\text{I}_2$ , needles, m. 165°, of *tetramethyl-3,3'-diaminodiphenylmethane*,  $\text{C}_{17}\text{H}_{20}\text{N}_2$ , the oily, free base being obtainable by heating the methiodide with soda-lime in an atm. of H or with concd. aq.  $\text{NH}_3$  in a sealed tube at 180–190°. C. J. WEST.

**Dihydrophenazine and dihydroacridine.** ROLAND SCHOLL AND W. NEUBERGER. *Monatsh.* 39, 238(1918); *J. Chem. Soc.* 114, I, 505.—Dihydrophenazine and dihydroacridine are formed when phenazine and acridine, resp., in hot alc. are gradually introduced into an aq.-alc. alk. soln. of  $\text{Na}_2\text{S}_2\text{O}_4$ . C. J. WEST.

**Phenylpropionamidine.** ROLAND SCHOLL AND E. BERTSCH. *Monatsh.* 39, 238–40(1918); *J. Chem. Soc.* 114, I, 495.—Phenylpropionamidine,  $\text{NH}:\text{C}(\text{Et})\text{NHPh}$ , m. 72–3°, is formed when EtCN is heated with  $\text{PhNH}_2\text{HCl}$  in a sealed tube at 170–80° for 12 hours; *hydrochloride*, hygroscopic; *hydrogen oxalate*, m. 141–2°; *picrate*, m. 152–3°. C. J. WEST.

**Acetyl cyanide.** ROLAND SCHOLL AND JOSEF ADLER. *Monatsh.* 39, 240(1918); *J. Chem. Soc.* 114, I, 482.—AcCN is conveniently prepd. by boiling a soln. of oximinoacetone in  $\text{CS}_2$  with a little more than the theoretical quantity of  $\text{P}_2\text{O}_5$  for 0.75 hr. and then distg.; the yield is approx. 40%. C. J. WEST.

**Dibromopyranthrone and attempts to prepare benzanthrone.** ROLAND SCHOLL. *Monatsh.* 39, 231–6(1918); *J. Chem. Soc.* 114, I, 484.—(With W. NEUBERGER). The substance obtained by the action of Br at 100° on pyranthrone is a *dibromo compound*,  $\text{C}_{20}\text{H}_{12}\text{O}_2\text{Br}_2$ . (With W. TRITSCH.) *2-Iodo-1-methylnaphthalene*,  $\text{C}_{11}\text{H}_9\text{I}$ , pearly, m. 51.5°, prepd. from 1,2- $\text{C}_{10}\text{H}_8\text{MeNH}_2$  by the diazo-reaction, when heated with finely pulverized Cu at 220–260° undergoes conversion into 1,1'-*dimethyl-2,2'-dinaphthyl*,  $\text{C}_{20}\text{H}_{18}$ , needles, m. 230°. The corresponding *dibenzyl-2,2'-dinaphthyl*,  $\text{C}_{24}\text{H}_{22}$ , and *di-p-chlorobenzyl-2,2'-dinaphthyl*, obtained by heating  $\text{PhCH}_2\text{Cl}$  and  $p\text{-ClC}_6\text{H}_4\text{CH}_2\text{Cl}$ , resp., with (2- $\text{C}_{10}\text{H}_7$ )<sub>2</sub> in the presence of  $\text{ZnCl}_2$ , were not pure substances. C. J. WEST.

**2-Methylantracene.** ROLAND SCHOLL. *Monatsh.* 39, 237–8(1918); *J. Chem. Soc.* 114, I, 484.—2-Methylantracene,  $\text{C}_{15}\text{H}_{12}$ , can be obtained by the action of HI and P on 2-methylantraquinone. C. J. WEST.

**Binuclear quinones. Chemical action of light.** HANS MEYER AND ALFRED ECKERT. *Monatsh.* 39, 241–51(1918); *J. Chem. Soc.* 114, II, 385–6.—Meyer and Hofmann have shown that dihydroanthracene, when heated, readily decomps. into anthracene and H, and it is therefore to be expected that the same dissociation should occur under the influence of light. Contrary to the statement of Orndorff and Cameron, this substance does undergo chem. alteration when exposed to light from the sun or elec. arc, the products being H and para-anthracene, the latter being formed by the immediate polymerization of the “nascent” anthracene, which is the primary product. In the presence of substances capable of reacting with this “nascent” anthracene, other products may be obtained. The action of light on anthracene probably also gives rise to “nascent” anthracene in which the diagonal valency becomes resolved into 2 free valencies. By these the formation of para-anthracene becomes possible. If O is present, the products are anthraquinone and dihydrodianthrone, the latter being formed by the further action of light on anthranol, which represents an intermediate stage of the change. It is already known that solns. of benzoquinone and thymoquinone in EtOH when subjected to light give rise to AcH and the corresponding quinol. With anthraquinone, however, the quinol deriv. is unstable, and in contact with air regenerates anthraquinone; it is therefore possible to use anthraquinone as a catalyst for the oxidation of EtOH to AcH in light, the only other product being a small quantity of an unidentified substance which gives a brown soln. in aq. KOH. In a similar manner iso-PrOH can be oxidized to acetone, but MeOH is very stable and is recovered

completely unchanged, together with the anthraquinone. This relative stability of MeOH accords well with the earlier results of Meyer and Hofmann and may account for the preponderance of Me derivs. among the naturally occurring alkyl compds. 9,10-Dichloro- and 9,10-dibromoanthracene are unaffected by light but 10-bromoanthracene in alc. gradually gives rise to anthraquinone and Br ions, together with a temporary small deposit of para-anthracene. If dihydroanthracene in  $\text{Ac}_2\text{O}$  is submitted to the action of light, the 1st deposit of para-anthracene may disappear on prolonged treatment, probably by further oxidation to anthraquinone. Anthranil acetate is obtained as a by-product, its formation supplying an explanation of the origin of dihydroanthracene in the action of light and air on anthracene in alc. soln. Solns. of anthracene in AcOH,  $\text{CHCl}_3$  and  $\text{Me}_2\text{SO}_4$ , when illuminated, give the same products; it was hoped with the aid of  $\text{Me}_2\text{SO}_4$  to isolate anthraquinol in the form of the di-Me ether, but unfortunately this compd. is sensitive to light and in AcOH is rapidly converted into anthraquinone.

C. J. WEST.

**Scoparin.** J. HERZIG AND GERTRUD TIEING. *Monatsh.* 39, 253-67(1918); *J. Chem. Soc.* 114, I, 503.—Goldschmiedt and von Hemmelmayr have shown that scoparin obtained from *Spartium scoparium* contains a MeO group and 6 HO radicals and attributed to the substance the formula  $\text{C}_{24}\text{H}_{30}\text{O}_{16}$ ; it was found possible to alkylate only 1 HO radical. By using  $\text{CH}_3\text{N}_3$ , however, it is possible to obtain a dimethyl derivative (trimethylnorscoparin),  $\text{C}_{24}\text{H}_{32}\text{O}_{12}$ , yellow crystals, m.  $260-5^\circ$  (decompn.), and a trimethyl derivative (tetramethylnorscoparin),  $\text{C}_{24}\text{H}_{34}\text{O}_{12}$ , yellow crystals, m.  $220-38^\circ$ , together with an amorphous substance. With MeI and  $\text{Ag}_2\text{O}$ , it is possible to convert scoparin into a cryst. octamethylnorscoparin,  $\text{C}_{24}\text{H}_{42}\text{O}_8(\text{OMe})_8$ , m.  $120-30^\circ$ , with subsequent resolidification and m.  $229-33^\circ$ . The compn. of these substances, as also that of acetylscoparin, renders it probable that the mol. formula of scoparin is not  $\text{C}_{20}\text{H}_{20}\text{O}_{16}$ , but  $\text{C}_{24}\text{H}_{30}\text{O}_{16}$ .

C. J. WEST.

**Eserine (physostigmine).** J. HERZIG AND HANS LIEB. *Monatsh.* 39, 285-92 (1918); *J. Chem. Soc.* 114, I, 504.—The ordinary method for detg. Me-N in eserine gives a result indicating the presence of 2 such groups, whereas the compd. obtained after the removal of 2 Me radicals, when examd. by the micro-method, shows the presence of a 3rd Me group; eseroline, when examd. by the micro-method, also gives results almost twice as high for Me-N as by the macro-method. This difference appears to be due to the larger proportion of HI used in the micro-method, and if in the macro-method only 0.1 g. of eserine is taken to 20 cc. HI, the result agrees with the presence of 3 Me-N groups. The reason of this peculiarity of eserine is at present undecided, although the possibility that the 3rd and resistant radical is an Et group, and not a Me, receives some support from the behavior of eserine when examd. by Kirpal and Bähm's method for Me detn.

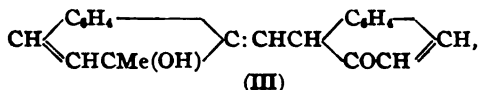
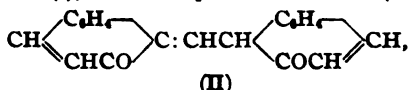
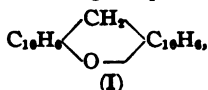
C. J. WEST.

**Two new trihydric alcohols.** MORITZ KOHN AND VIKTOR NEUSTADTER. *Monatsh.* 39, 293-8(1918); *J. Chem. Soc.* 114, I, 477.—It has already been found possible by the action of  $\text{MeMgI}$  on the lactone of  $\text{Me}_3\text{C}(\text{OH})\text{CH}_2\text{CMe}(\text{OH})\text{CO}_2\text{H}$  to obtain  $\text{Me}_3\text{C}(\text{OH})\text{CH}_2\text{CMe}(\text{OH})\text{CMe}_2\text{OH}$ . Formisobutyraldol, by successive treatment with  $\text{NaHSO}_4$  and KCN, can be converted into the lactone of  $\text{CH}_2(\text{OH})\text{CMe}_2\text{CH}(\text{OH})\text{CO}_2\text{H}$ , b<sub>11</sub>  $118-20^\circ$ , b.  $237-41^\circ$ , which reacts with  $\text{MeMgI}$  to form  $\gamma, \alpha, \delta$ -trihydroxy- $\beta, \beta, \delta$ -trimethylpentane,  $\text{HOCH}_2\text{CMe}_2\text{CH}(\text{OH})\text{CMe}_2\text{OH}$ , b<sub>11</sub>  $152-5^\circ$ , b.  $256-262^\circ$ , which slowly solidifies to a cryst. mass, m.  $68-7^\circ$ . When heated with 33%  $\text{H}_2\text{SO}_4$ , this compd. yields a substance, probably 4-hydroxy-3,3,5,5-tetramethyltetrahydrofuran,  $\text{CMe}_2\text{O.CMe}_2\text{CMe}_2\text{CHOH}$ .

The action of  $\text{PhMgBr}$  on the lactone proceeds in an analogous manner, and yields  $\alpha, \gamma, \delta$ -trihydroxy- $\delta, \delta$ -diphenyl- $\beta, \beta$ -dimethylbutane, microscopic needles, m.  $130-3^\circ$ .

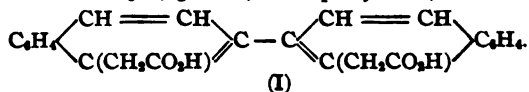
C. J. WEST.

The quinonoid oxidation product of methylenedi- $\beta$ -naphthol. MORITZ KOHN AND ALFONS OSTERSETZER. *Monatsh.* 39, 299-306(1918); *J. Chem. Soc.* 114, I, 501-2. —The yellow quinonoid oxidation product of methylenedi- $\beta$ -naphthol was regarded by Abel as having the peroxide structure (I), but the *o*-quinonoid formula (II), is now

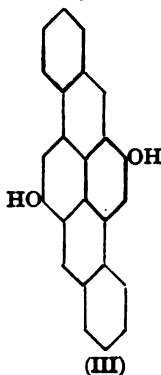
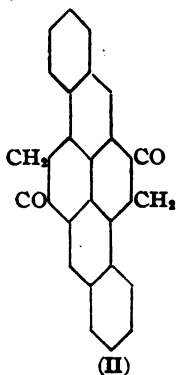


proposed. This structure is in accordance with the formation of a *phenylhydrazone*,  $\text{C}_{27}\text{H}_{18}\text{ON}_2$ , orange-red needles, m.  $153-6^\circ$ , only the *o*-quinonoid CO group reacting with the usual reagent for ketonic substances; the phenylhydrazone on reduction with Zn and alc. AcOH yields a *dihydro derivative*,  $\text{C}_{27}\text{H}_{20}\text{ON}_2$ , colorless powder, m.  $133-6^\circ$ ; this deriv. is probably a hydrazo compd., while the parent phenylhydrazone is of the azo structure. With  $\text{MeMgI}$ , the quinonoid compound reacts, forming a *substance*,  $\text{C}_{22}\text{H}_{18}\text{O}_2$ , probably (III), needles, m.  $135-45^\circ$ , and with  $\text{PhMgBr}$  an analogous compound,  $\text{C}_{27}\text{H}_{20}\text{O}_2$ , prisms, m.  $130-70^\circ$ , is obtained.  $\text{Me}_2\text{SO}_4$  converts methylenedi- $\beta$ -naphthol into the *dimethyl ether*,  $\text{C}_{22}\text{H}_{18}\text{O}_2$ , leaflets, m.  $144-7^\circ$ . C. J. WEST.

Attempted synthesis of 3,4,8,9-dibenzopyrene. RICHARD WEITZENBÖCK. *Monatsh.* 39, 307-13(1918); *J. Chem. Soc.* 114, I, 493-4. —By the synthetic method already discovered for pyrene it should be possible to produce pyrene derivs. containing condensed hydrocarbon nuclei. This paper records an unfinished investigation in this direction. 1,1'-Dimethyl-2,2'-dinaphthyl (*a*), prepd. by the action of Cu on 1,2- $\text{C}_{10}\text{H}_7\text{MeI}$ , is accompanied by a *substance*,  $\text{C}_{22}\text{H}_{18}$ , leaflets, m.  $314-6^\circ$ ; *picrate*, brick-red needles, m.  $199-201^\circ$ . When brominated in boiling  $\text{PhNO}_2$  (*A*) is converted into 1,1'-dibromomethyl-2,2'-dinaphthyl,  $\text{C}_{22}\text{H}_{16}\text{Br}_2$ , needles, m.  $200-1^\circ$ , which reacts with aq.-alc. KCN yielding 2,2'-dinaphthylene-1,1'-diacetonitrile, crystals, m.  $246^\circ$ , this on hydrolysis with alc. KOH at  $150^\circ$ , gives 2,2'-dinaphthylene-1,1'-diacetic acid (I). From

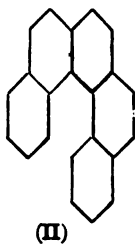
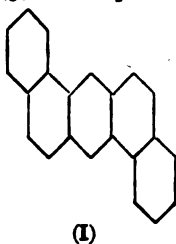


this, by the stages represented by formulas (II) and (III) it should be possible to obtain 3,4,8,9-dibenzopyrene (IV). In a preliminary investigation with a view to a new pyrene synthesis, *o*- $\text{IC}_6\text{H}_4\text{CHClCHClCO}_2\text{H}$ , obtained by the action of Cl on a  $\text{CS}_2$  soln. of



$o\text{-IC}_6\text{H}_4\text{CH:CHCO}_2\text{H}$ , was steamed distd. in the presence of excess of  $\text{Na}_2\text{CO}_3$  with the formation *o*-iodostyryl chloride,  $\text{C}_6\text{H}_4\text{ICH:CHCl}$ ,  $b_m$   $151^\circ$ . C. J. WEST.

Synthesis of the isomeric hydrocarbons 1,2,5,6-dibenzanthracene and 3,4,5,6-dibenzophenanthrene. RICHARD WEITZENBÖCK AND ALBERT KLINGLER. *Monatsh.* 39, 315-23(1918); *J. Chem. Soc.* 114, I, 494.—When heated with  $o\text{-NO}_2\text{C}_6\text{H}_4\text{CHO}$  in  $\text{Ac}_2\text{O}$ , K phenylenediacetate undergoes conversion into *o*-nitrobenzylidene-*p*-phenylenedi-acetic acid,  $\text{HO}_2\text{CCH}_2\text{C}_6\text{H}_4(\text{CO}_2\text{H})\text{:CHC}_6\text{H}_4\text{NO}_2$ , needles,  $m.$   $236^\circ$ , which by further treatment can be made to yield *di-o*-nitrobenzylidene-*p*-phenylenedi-acetic acid,  $\text{C}_6\text{H}_4(\text{C}(\text{CO}_2\text{H})\text{:CHC}_6\text{H}_4\text{NO}_2)_2$ , pale yellow prisms,  $m.$   $308^\circ$  (decompn.). This substance on reduction in  $\text{NH}_4\text{OH}$  with  $\text{Fe}(\text{OH})_2$  gives *di-o*-aminobenzylidene-*p*-phenylenedi-acetic acid, yellow needles,  $m.$  near  $276^\circ$ , which by diazotization and subsequent treatment with Cu powder can be made to yield a mixt. of 1,2,5,6-dibenzanthracenedicarboxylic acid and 3,4,5,6-dibenzophenanthracenedicarboxylic acid; these were not sepd., the mixt. being directly converted by heating under reduced pressure into a mixt. of the corresponding hydrocarbons, which were then sepd. by crystn. from  $\text{AcOH}$ . The less sol. 1,2,5,6-dibenzanthracene (I) forms silvery leaflets,  $m.$   $262^\circ$  (picrate,  $\text{C}_{22}\text{H}_{14.2}\text{C}_6\text{H}_5\text{O}_7\text{N}_3$ , orange needles,  $m.$   $214^\circ$ ), gives a red soln. with alk.  $\text{Na}_2\text{S}_2\text{O}_4$  soln. and is oxidized by  $\text{K}_2\text{CrO}_4$  in  $\text{AcOH}$  to 1,2,5,6-dibenzanthraquinone,  $\text{C}_{22}\text{H}_{12}\text{O}_2$ , orange needles,  $m.$   $248\text{--}9^\circ$ , while the more sol. 3,4,5,6-dibenzophenanthracene (II) forms colorless needles,  $m.$   $145\text{--}6^\circ$ .



C. J. WEST.

Nature of cyclic quinoneimide dyes. F. KEHRMANN. *Ann.* 414, 131-88(1918); *J. Chem. Soc.* 114, I, 449-50.—This is a theoretical paper, containing a discussion of the results of investigations of the constitutions of cyclic quinoneimide dyes. The classes discussed are azonium compounds (azines, safranines, indulines), azthionium (thionines), azoxonium (azoxines), carboxonium and carbothionium (pyronines), rosamines, thiopyronines, cyanopyronines, cyanoacridines and acridonium. The discussion starts with the desmotropy of 6-hydroxynaphthaphenazine recorded by K. and Messinger in 1891, and this strikes the keynote of K.'s treatment of the subject. The dyes in general are regarded as desmotropic substances which acquire the *o*- or *p*-quinonoid structure according to the conditions, *e. g.*, rosinduline and induline salts are *o*-quinonoid, but the free bases are *p*-quinonoid. C. J. WEST.

Aminohydrazines. V. *m*-Amino-*p*-tolyl- $\beta$ -benzylhydrazine. HARTWIG FRANZEN AND CORLESTIN MONDLANGE. *Ann.* 414, 189-95(1918); *J. Chem. Soc.* 114, I, 458.—This aminohydrazine has been examd. in order to ascertain whether the yellow color and the capacity to form intensely colored salts exhibited by *o*-aminophenyl- $\beta$ -benzylhydrazine are general characteristics of such compds. Benzaldehyde *m*-nitro-*p*-tolylhydrazine in boiling alc.  $\text{NH}_4\text{OH}$  soln. is treated with  $\text{Na}_2\text{S}_2\text{O}_4$ , whereby sodium *m*-amino-*p*-tolyl- $\beta$ -benzylhydrazinesulfonate and benzaldehyde-*m*-amino-*p*-tolylhydrazone are obtained, which are sepd. by boiling  $\text{H}_2\text{O}$ , in which the former, pale yellow leaflets,  $m.$   $212^\circ$ , is insol. It is decompd. by boiling 0.5 *N*  $\text{H}_2\text{SO}_4$ , yielding  $\text{SO}_2$  and benzaldehyde *m*-amino-*p*-tolylhydrazone, which is then converted into phenylmethylbenziminazole (A) and  $\text{NH}_3$ . Benzaldehyde *m*-amino-*p*-tolylhydrazone, obtained from the hot aq.

filtrate, forms golden yellow leaflets, m.  $167^{\circ}$ , is converted by cold 10% HCl into (A) and  $\text{NH}_3$ , and in boiling alc. is reduced by 3% Na-Hg, yielding *m*-amino-*p*-tolyl- $\beta$ -benzylhydrazine,  $\text{H}_2\text{NC}_6\text{H}_4\text{MeNHNHCH}_2\text{Ph}$ , intensely yellow needles, m.  $87^{\circ}$ , which forms yellow solns. in org. solvents and develops in alc. an intense magenta color on the addition of a little dil. mineral acid.

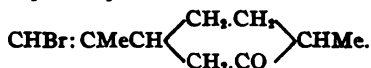
C. J. WEST.

**Terpenes and ethereal oils.** CXX. O. WALLACH. *Ann.* 414, 195-233 (1918); *J. Chem. Soc.* 114, I, 445-6.—Most of the work has been abstracted previously. (With KURT PELIKAN.) From the accepted formula of pinol hydrate and dihydrocarveol, the expectation is justifiable that the reduction product of the former will be identical with the menthane-2,8-diol obtained from the latter by the addition of  $\text{H}_2\text{O}$ . The expectation, however, is not fulfilled. *i*-Pinol hydrate yields by reduction a glyco-dihydropinol hydrate, m.  $139-41^{\circ}$ , while the *i*-glycol obtained from dihydrocarveol m.  $108-9^{\circ}$ . Also, *d*-pinol hydrate (sobrerol) reduced in MeOH by Paal's method yields a glycol, m.  $158-9^{\circ}$ ,  $[\alpha]_D^{20} -40^{\circ} 26'$  in alc., while the glycol derived from the optically active dihydrocarveol m.  $113-4^{\circ}$ . The behavior of pinol hydrate on reduction, therefore, has been examd. When it is reduced by H and colloidal Pd in the absence of free acid, there occurs, in addition to the normal reduction, a by-reaction, in which the pinol hydrate is dehydrated and the resulting unsatd. monohydric alc. reduced to tetrahydrocarveol. This result not only again shows that unsatd. glycols are not always smoothly reduced to the satd. glycols in the presence of colloidal metal, but is further proof that in pinol hydrate a HO group occurs in position 2. *i*- or *l*-Dihydropinol hydrate is converted into terpinene dihydrobromide by treatment with HBr in glacial AcOH. A similar transformation is not produced by HCl. Moreover, the menthane-2,8-diol obtained from dihydrocarveol does not behave in this way. It is shown that dihydropinol hydrate is not identical with menthane-1,4-diol nor with *menthane-2,4-diol*, obtained by reducing sabinene glycol by Paal's method. The latter diol b,  $135-40^{\circ}$ ; the distillate solidifies completely (m.  $93-4^{\circ}$ ) but seps. as an oil from solvents on account of its great soly. When dehydrated by  $(\text{CO}_2\text{H})_2$  and  $\text{H}_2\text{O}$ , it yields a small quantity of a hydrocarbon, b.  $172-82^{\circ}$ ,  $d_{20} 0.866$ , showing the reactions of terpinene, the main product being an unsatd. *alcohol*,  $\text{C}_{10}\text{H}_{17}\text{OH}$ , b.  $219-21^{\circ}$ ,  $d_{20} 0.9250$ ,  $n_D 1.4790$ , which yields carvenone by oxidation with  $\text{CrO}_3$  and tetrahydrocarveol by reduction by Paal's method. The alc. would therefore appear to be  $\Delta^2$ -menthane-2-ol, but that  $\Delta^{4(8)}$ -menthene-2-ol is also present is indicated by the formation of acetone when the alc. is oxidized by  $\text{KMnO}_4$ . When *i*-dihydropinol hydrate is warmed with  $(\text{CO}_2\text{H})_2$  and  $\text{H}_2\text{O}$ , the main product is a satd. oxide, having an odor of cineole. Dihydrocarveol is formed as a by-product. CXXI. Pulegenic acid and the conversion of carvone into pulegenic acid. *Ibid* 414, 233-43 (1918); *J. Chem. Soc.* 114, I, 428-9.—An improved method of prepg. pulegenic acid is to shake pulegone dibromide with aq. KOH for 1 hr. at the ordinary temp. and then for 3 hrs. at  $100^{\circ}$ . Unchanged pulegone and methylcyclohexanone are removed by steam and pulegenic acid is extd. by  $\text{Et}_2\text{O}$  from the somewhat concd. acidified residual soln. Like other substances containing a semicyclic linking, pulegenic acid and its amide are difficult to reduce to the satd. condition; this, however, can be carried out as follows: HCl is added to Me pulegenate and then removed again with simultaneous hydrolysis. The product is a mixt. of ordinary pulegenic acid and an isomeride. By distn. under ordinary pressure the former is converted into pulegone, while the latter distils at  $256-60^{\circ}$  with slight decompn. It is converted into its amide, m.  $152^{\circ}$ , which is easily reduced by H and colloidal Pd to dihydropulegenamide, m.  $150-1^{\circ}$  (Eykmán gives  $147^{\circ}$ ), from which dihydropulegenic acid (1-methyl-3-isopropylcyclopentane-2-carboxylic acid), b.  $139^{\circ}$   $d_{20} 0.9600$ ,  $n_D 1.4524$ , is readily obtained. An alternative and more convenient method is to heat Me hydrochloropulegenate with  $\text{PhNH}_2$ , to reduce the resulting unsatd. ester by Skita's



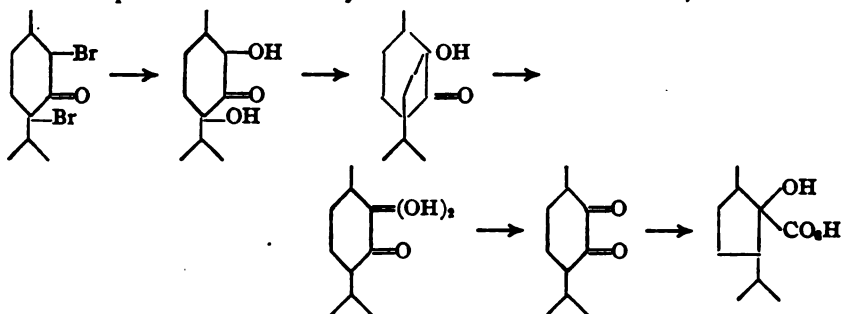


pulegone into the 5-ring pulegic acid under the action of alkali have hitherto not been known. W. has therefore examd. the behavior of a number of di-Br derivs. of menthone and of carvomenthone when digested with 2% aq. KOH at the ordinary temp. for 2-3 days, and finds that the course of the reaction is detd. essentially by the position of the Br atoms. The results may be generalized as follows: (1) Phenols are formed from di-Br derivs. which have been obtained by the addition of Br at an ethylene linking adjacent to the CO group and not sepd. from it by a substituent; e. g., 1,2-dibromomenthone and 3,4-dibromocarvomenthone. The formation of the phenol does not always take place smoothly, comparatively stable monobromides sometimes being formed. (2) When the ethylenic linking is adjacent to the CO group, but is sepd. from it by a substituent, the di-Br deriv., e. g., 4,5-dibromomenthone and 1,6-dibromocarvomenthone, readily undergoes fission of the ring with the production of an aliphatic ketonic acid with the same number of C atoms. (3) When the 2 Br atoms are divided by the nucleus and the side-chains, or are both in the side-chains, the course of the reaction may be very varied and a general rule cannot be formulated. (4) Di-Br derivs. in which the Br atoms are attached to nuclear C atoms on either side of the CO group, e. g., 2,4-dibromomenthone and 1,3-dibromocarvomenthone, are converted into pentacyclic hydroxycarboxylic acids (see following abstr.). (With H. E. WOODMAN.) When shaken for 3 days with 2% aq. KOH, 8,9-dibromomenthan-2-one, prepd. by the bromination of optically active dihydrocarvone, is converted, apart from small quantities of carvacrol and carvenone, into a heavy oil, which loses HBr and yields carvacrol when distd. in vacuum, and is reduced to dihydrocarvone by Zn and aq. NaOH and is therefore probably the monobromide.

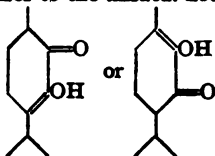


The cryst. dihydrocarvone dibromide, m. 69-70°, obtained by brominating 1-dihydrocarvone in glacial AcOH containing HBr, is converted by 2% aq. KOH into an unsatd. *hydroxy ketone*,  $\text{C}_{10}\text{H}_{14}\text{O}_2$ ,  $b_{\text{D}} 140^\circ$ ,  $d_{20} 1.0285$ ,  $n_D 1.4917$  (semicarbazone, m. 123-4°), which yields carvacrol by warming with dil.  $\text{H}_2\text{SO}_4$  and is possibly 8-hydroxy- $\Delta^4$ -menthene-2-one or 8-hydroxy- $\Delta^5$ -menthene-2-one. 3,4-Dibromocarvomenthone is converted by 2% KOH into carvacrol and similarly 1,2-dibromomenthone into *m*-cresol. (With E. H. WOODMAN and W. JESSEN.) 1,6-Dibromocarvomenthone is converted by shaking with 2% KOH for 2-3 hrs. at the ordinary temp. and then for 1-2 hours at 100° into  $\epsilon$ -keto- $\beta$ -isopropylheptoic acid, which is identified as the optically active modification by the formation of the semicarbazone, m. 158-9°, and the oxime, m. 60-3° (rising to 87-9° by recrystn.). (With ADOLF HALLSTEIN.) When 1,2-dibromomenthone is shaken for 16-20 hrs. with the quantity of 2% aq. KOH calcd. to remove all the Br, a *monobromide*,  $\text{C}_{10}\text{H}_{11}\text{OBr}$ , m. 42-3°, is obtained, together with some thymol. The monobromide is converted into thymol by heating it alone, when HBr is evolved, or with MeONa. This behavior and the method of prepn. indicate that the monobromide is 2-bromo- $\Delta^4$ -menthen-3-one, or 2-bromo- $\Delta^1$ -menthen-3-one, but the substance does not react readily with Br and yields by oxidation with  $\text{KMnO}_4$  ( $\text{CO}_2\text{H}$ )<sub>2</sub>, volatile fatty acids and a *ketonic acid*,  $\text{C}_{10}\text{H}_{14}\text{O}_3$ , m. 105-6° (*silver salt*,  $\text{C}_{10}\text{H}_{11}\text{O}_3\text{Ag}$ ; *semicarbazone*, m. 225°); the formation of the last acid is not explicable by either of the formulas given above. (With EMMA GROTE.) 4,5-Dibromomenthone is converted by 2% aq. KOH into an aliphatic *ketonic acid*,  $\text{C}_{10}\text{H}_{14}\text{O}_3$ , *silver salt*,  $\text{C}_{10}\text{H}_{11}\text{O}_3\text{Ag}$ ; *semicarbazone*, m. 161-3° (slowly heated) or 164-6° (rapidly heated), which is probably  $\epsilon$ -keto- $\beta$ , $\delta$ -dimethyloctic acid,  $\text{PrCOCH}_2\text{CH}_2\text{CHMeCH}_2\text{CO}_2\text{H}$ . An unsatisfactory attempt to prep.  $\Delta^4(5)$ -menthen-3-one from 4-bromomenthan-3-one is described. CKXIV. Method of transforming hexacyclic ketones into cyclopentanones based on the conversion of dibrominated cyclohexanones into pentacyclic  $\alpha$ -hydroxycar-

boxylic acids. (With MATHILDE GERHARDT and WILHELM JESSEN.) *Ibid* 414 296-366(1918); *J. Chem. Soc.* 114, I, 442-4.—The brominated cyclohexanones which contain the Br atoms in such positions that pentacyclic  $\alpha$ -hydroxycarboxylic acids are produced by the action of alkalis are in general easily obtained by treating the cyclohexanone in glacial AcOH with 4 atoms of Br. Since cyclopentanones are known only in small numbers while cyclohexanones can be obtained in large numbers, not only from natural sources but also from phenols by Sabatier's method and by Knoevenagel's synthesis, it is of importance to find out whether it is possible quite generally to convert cyclohexanones into pentacyclic  $\alpha$ -hydroxycarboxylic acids with the same number of C atoms, from which cyclopentanones can be obtained by oxidation. Up to the present time 9 cyclohexanones have been converted into cyclopentanones by the elimination of a nuclear methylene group, the pentacyclic  $\alpha$ -hydroxycarboxylic acids being intermediate products. The formation of these would be easily explicable if the original dibromocyclohexanone contained a CBr<sub>2</sub> group adjacent to the CO group, because the alkali would then produce an *o*-diketone, from which the pentacyclic acid would be formed by a benzilic acid transformation. This simple explanation is inapplicable for 2 reasons: It is proved that by direct substitution in menthone and carvomenthone the 2 Br atoms are not attached to 1 and the same C atom, but that 1 Br replaces the tertiary H atom adjacent to the CO group and the other enters the CH<sub>3</sub> group on the other side of the CO group. Although compds. having the compn. of *o*-diketones can be isolated they do not exhibit the properties of such substances but behave as unsatd. ketols. Such compds. derived from the dibromomenthone and dibromocarvomenthone are identical and yield the same pentacyclic hydroxycarboxylic acid. W. explains this schematically as follows for dibromomenthone,



and similarly for the dibromocarvomenthone; the same *o*-diketone is formed in both cases, but when isolated isomerizes to the unsatd. ketol,



The bromination of 1,3-dimethylcyclohexan-5-one in cold glacial AcOH produces 2 di-Br compounds, an  $\alpha$ -dibromide, C<sub>8</sub>H<sub>12</sub>OBr<sub>2</sub>, needles, m. 163-4° (decompn.), which is scarcely attacked by alkali, and an isomeric  $\beta$ -dibromide, prisms, m. 60-1°, which is converted by 2% aq. KOH into the ketol, C<sub>8</sub>H<sub>12</sub>O<sub>2</sub>, m. 71-2°. The ketol, which is removed from the acidified liquid by steam, is converted by concd. aq. KOH at 140° into 4-hydroxy-1,3-dimethylcyclopentane-4-carboxylic acid, C<sub>8</sub>H<sub>14</sub>O<sub>3</sub>, m. crystals, m. 92-3°, which yields 1,3-dimethylcyclopentan-4-one, b. 152-4°, d<sub>17</sub> 0.8950, n<sub>D</sub><sup>17</sup> 1.4330 (semicarbasone, m. 165-6°), by warming with PbO<sub>2</sub> and H<sub>2</sub>SO<sub>4</sub>. CXXV. Compounds

of the eucarvone series. (With MAX STANDACHER.) *Ibid* 414, 376-75(1918); *J. Chem. Soc.* 114, I, 444.—Assuming the constitution given to  $\beta$ -dihydroeucarvoxime (*C. A.* 8, 1572) to be correct, the reduction of this substance should yield tetrahydroeucarvylamine. This is found to be so. When reduced by Na and alc., the oxime is converted into a base,  $C_{10}H_{19}NH_2$ , b.  $208.5^\circ$ ,  $d_{20}$  0.8680,  $n_D$  1.4665, which forms a carbamide, m.  $139^\circ$ , phenylcarbamide, m.  $143-6^\circ$ , trimethylammonium iodide, m. about  $200^\circ$ , and an acetyl derivative, m.  $110.5^\circ$ , the last being identical with the substance obtained by acetylating the base prep'd. by the reduction of tetrahydroeucarvoxime. By bromination in glacial AcOH at  $0^\circ$ , tetrahydroeucarvone yields a monobromo derivative,  $C_{10}H_{17}OBr$ , crystals, m.  $32^\circ$ , which is converted by 3% aq. KOH into hydroxyletetrahydroeucarvone,  $HOC_{10}H_{17}O$ , b.  $128.5^\circ$ ,  $d_{20}$  0.9810,  $n_D$  1.4626 (semicarbazone, m.  $193^\circ$ , oxime, m.  $84^\circ$ , which forms a cryst. sodium salt). The HO compound is reduced to a glycol,  $C_{10}H_{18}(OH)_2$ , b.  $112-7^\circ$ , by Na and alc., and yields a chromate,  $(C_{10}H_{17}O)_2CrO_4$ , when treated with  $H_2SO_4$  and  $CrO_3$  dissolved in a little  $H_2O$ , at a temp. not exceeding  $0^\circ$ . When treated with Br (2 mols.) in glacial AcOH without cooling, tetrahydroeucarvone yields dibromotetrahydroeucarvone,  $C_{10}H_{16}OBr_2$ , prisms, m.  $68^\circ$ , which is converted by 4% aq. KOH at  $100^\circ$  into an acid,  $C_{10}H_{16}O_2$ , crystals, m.  $91.5-92.5^\circ$  (silver salt,  $C_{10}H_{15}O_2Ag$ ). The acid is sat'd., odorless, and somewhat easily volatile with steam. Its constitution has not yet been det'd. When treated with MeOH-MeONa, dibromotetrahydroeucarvone yields a substance,  $C_{10}H_{16}O_2$ , b.  $218-9^\circ$ ,  $d_{20}$  0.979,  $n_D$  1.4698, isomeric with the preceding acid, the nature of which has not yet been ascertained.

C. J. WEST.

$\alpha$ -Naphthoic sulfinide. KURT KALCHER. *Ann.* 414, 244-9(1918); *J. Chem. Soc.* 114, I, 433.— $\alpha, \beta$ - $C_{10}H_6(CN)SO_2Cl$ , m.  $143-4^\circ$ , is converted by  $NH_3$  gas in hot, dry  $C_6H_6$  into  $\alpha$ -cyanonaphthalene- $\beta$ -sulfonamide, monoclinic crystals, decomp.  $330-40^\circ$ , which is converted by boiling 0.1 *N* NaOH (1.25 mols) and subsequent acidification into  $\alpha$ -naphthoic sulfinide,  $C_{10}H_6CO.NH.SO_2$ , clusters of small prisms, m.  $244^\circ$ , to-

gether with the Na salt of an acidic by-product. The sulfinide, which is best purified through its sodium salt, long, flattened needles, has a bitter taste and forms a methyl derivative, leaflets, m.  $220-1^\circ$ , which yields  $MeNH_2$  by hydrolysis with 35% HCl at  $150^\circ$ . The nature of the acidic by-product was not established.

C. J. WEST.

Synthesis of elemicin and of isoelemicin. F. MAUTHNER. *Ann.* 414, 250-5 (1918); *J. Chem. Soc.* 114, I, 428.—2,6-Dimethoxyphenyl allyl ether,  $(MeO)_2C_6H_3OCH_2CH:CH_2$ , colorless oil, b.  $140-1^\circ$ , prep'd. from  $CH_2:CHCH_2Br$  and 2,6-( $MeO$ ) $_2C_6H_3OH$  in boiling acetone in the presence of  $K_2CO_3$ , is converted by heating at  $220^\circ$  in a few min. into 2,6-dimethoxy-4-allylphenol,  $HOC_6H_2(OMe)_2CH_2CH:CH_2$ , b.  $168-9^\circ$ , which yields by methylation with  $Me_2SO_4$  and 10% NaOH 3,4,5-trimethoxyallylbenzene, identical with elemicin. The position of the allyl group is proved by oxidizing the substance in acetone to gallic acid tri-Me ether by  $KMnO_4$  and of the double linking by the decompn. of the ozonide by  $H_2O$  whereby homogallaldehyde tri-Me ether is obtained. By heating with alc. KOH, the synthetic elemicin is converted into isoelemicin (3,4,5-trimethoxypropenylbenzene), the ozonide of which yields gallaldehyde tri-Me ether by decompn. with  $H_2O$ .

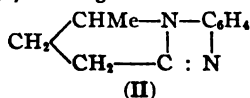
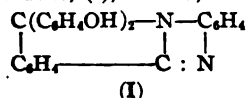
C. J. WEST.

Crystalline form of 3,7-dimethyl-1,4-diethyluric acid and of its glycol dimethyl ether. Correction. HEINRICH BILTZ AND FRITZ MAX. *Ann.* 414, 255(1918); *J. Chem. Soc.* 114, I, 455.—The description of the cryst. form of 3,7-dimethyl-1,9-diethyluric acid is really that of its glycol di-Me ether. The former crystals in small rhombohedra with blunted angles.

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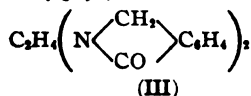
Action of *o*- and *peri*-diamines and of ethylenediamine on  $\gamma$ -lactones. A. BISTRZYCKI AND WALTHER SCHMUTZ. *Ann.* 415, 1-28(1918); *J. Chem. Soc.* 114, I,

452-4. — The behavior of  $o$ - $C_6H_4(NH_2)_2$  and of  $1,8$ - $C_{10}H_6(NH_2)_2$  with lactones derived from certain alcohol-acids has been examd.; 2 mols. of  $H_2O$  are eliminated and benzimidazole derivs. produced. When lactones derived from phenolic acids are employed, the same derivs. are again obtained but the condensation does not proceed beyond the elimination of 1 mol. of  $H_2O$ . Thus phthalide and  $o$ - $C_6H_4(NH_2)_2 \cdot HCl$ , heated at  $180$ – $200^\circ$ , yield the  $HCl$  salt of  $o$ -benzylenebenzimidazole, m.  $212$ – $3^\circ$  (*picrate*, yellow needles, decomp.  $243^\circ$ ) while phthalide and  $1,8$ - $C_{10}H_6(NH_2)_2$  in a similar reaction yield the  $HCl$  salt of benzyleneperimidine (phthaloperine). While phthalophenone does not react with  $o$ - $C_6H_4(NH_2)_2$  nor its  $HCl$  salt nor with  $1,2,4$ - $C_6H_3(NH_2)_3OEt$ , phenolphthalein reacts extremely vigorously with the former at  $230^\circ$ , yielding *di-p-hydroxyphenylbenzylenebenzimidazole*, (I), needles, decomp.  $354$ – $55^\circ$ , which gives a colorless soln. in dil.

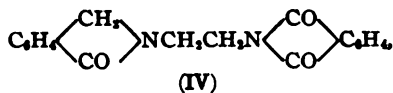


aq.  $KOH$  and forms a *picrate*, stout prisms, m.  $203$ – $4^\circ$ , and a *diacetate*, best isolated in the form of the *picrate*  $C_{28}H_{23}O_{11}N_3$ , yellow needles, decomp.  $285$ – $6^\circ$ . When a mixt. of valerolactone and  $o$ - $C_6H_4(NH_2)_2$  is heated, finally at  $270^\circ$ , *1,2*-(*1'*-methyltrimethylene)-benzimidazole (II) is obtained in poor yield as a brown oil; the *picrate*, yellow microscopic prisms, m.  $22$ – $4^\circ$  (darkening).  $o$ - $C_6H_4(NH_2)_2$  and the lactone of *o*-hydroxydiphenylacetic acid react quant. at  $120$ – $30^\circ$  to give *2-o-hydroxybenzohydrylbenzimidazole*,  $NH_2C_6H_4N : CCHPhC_6H_4OH$ , m.  $246$ – $7^\circ$ , which seps. from  $EtOH$  or  $C_6H_6$  in micro-

scopic, colorless leaflets containing 1 mol. of solvent and forms a *picrate*, stout, yellow prisms, m.  $216^\circ$ , with previous darkening; attempts to eliminate a 2nd mol. of water by fusion with  $P_2O_5$  or  $ZnCl_2$  were unsuccessful. The same lactone reacts with  $1,2,4$ - $C_6H_3(NH_2)_3OEt$  to form *4*-(or *3*)-ethoxy-*2-o-hydroxybenzohydrylbenzimidazole*,  $C_{22}H_{19}O_5N_3 \cdot H_2O$ , prisms, m.  $110$ – $20^\circ$ , with loss of the  $H_2O$  of crystn. With  $1,8$ - $C_{10}H_6(NH_2)_2$  at  $70$ – $100^\circ$  it reacts to form *2-o-hydroxybenzohydrylperimidine*, microscopic plates, m.  $295$ – $7^\circ$  (decompn.) and with the *1,2*-deriv. at  $120$ – $40^\circ$  quant. to form *2-o-hydroxybenzohydrylnaphthimidazole*,  $C_{24}H_{18}ON_3$ , microscopic prisms, m.  $294$ – $5^\circ$ , in which it has not not been detd. whether the  $NH$  group is attached to the  $C_{10}H_6$  nucleus in the  $\alpha$ - or  $\beta$ -position. The lactone of *2*-hydroxy-5-methyltriphenylacetic acid does not react with  $C_6H_4(NH_2)_2$  or its  $HCl$  salt. The behavior of  $C_2H_4(NH_2)_2$  with lactones is quite different from that of the aromatic diamines. When 2 mols. of phthalide in abs. alc. is boiled with a 50% aq. soln. of  $C_2H_4(NH_2)_2$  (1 or 2 mols.) an additive compound, *N,N'*-ethylenebis-[*2-hydroxymethylbenzamide*],  $C_2H_4(NHCOC_6H_4CH_2OH)_2$ , needles, m.  $183.5^\circ$ , is obtained on cooling after pouring into  $H_2O$ ; this forms a *diphenylurethan*,  $C_{24}H_{20}O_4N_4$ , needles, decomp.  $190^\circ$  (rapidly heated), when heated with phenylurea at  $160^\circ$ , and is oxidized by  $CrO_3$  in glacial  $AcOH$  to the dicarboxylic acid, which immediately changes to dipthalylethylenediimide by loss of  $H_2O$ . The additive compound loses  $H_2O$  above its m. p., and undergoes a partial change into *N,N'*-ethylenedipthalimide (III), prisms or needles, m.  $227.5$ – $9^\circ$ , which is also obtained in 80–90% yield by

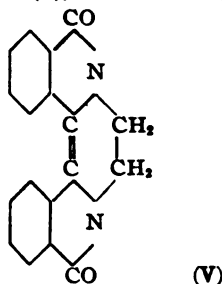


beating phthalide (2 mols.) and  $C_2H_4(NH_2)_2$  at  $300^\circ$  for 3 hrs. It is quite stable to boiling aq. or alc.  $KOH$ . By treatment with boiling  $CrO_3$  and pure  $AcOH$  it can be oxidized successively to *N,N'*-ethylenephthalimidephthalimidine (IV), needles, m.  $190$ – $1^\circ$ , and to *N,N'*-ethylenedipthalimide (dipthalylethylenediimide, Anderlini). The former of these is hydrolyzed by hot, moderately dil. aq.  $KOH$  to *N,N'*-ethylenephthal-



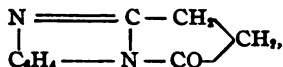
imidine-*o*-carboxybenzamide,  $\text{CO} \cdot \text{C}_6\text{H}_4 \cdot \text{CH}_2 \cdot \text{NCH}_2\text{CH}_2\text{NHCOC}_6\text{H}_4\text{CO}_2\text{H}$ , prisms,

decomp.  $172-3^\circ$  (*silver salt*,  $\text{C}_{18}\text{H}_{16}\text{O}_4\text{N}_2\text{Ag}$ , tufts of needles). When treated with Br (2 mols.) in glacial AcOH, which is then boiled for a few min., ethylenediphthalimidine yields a *tribromide*,  $\text{C}_{18}\text{H}_{16}\text{O}_3\text{N}_2\text{Br}_3$ , unstable, yellowish brown needles, decomp.  $187^\circ$  (rapidly heated), which is immediately decompd. by  $\text{H}_2\text{O}$  with regeneration of the imidine. Cl does not attack the imidine in glacial AcOH or  $\text{CCl}_4$ , but in the former soln. together with  $\text{Et}_2\text{O}$ , I produces a *diiodide*,  $\text{C}_{18}\text{H}_{16}\text{O}_3\text{N}_2\text{I}_2$ , dark brown prisms, m.  $180-1^\circ$ . Ethylenediphthalimidine is converted into diphthalyleneimidine by boiling with  $\text{PCl}_5$  and  $\text{POCl}_3$  and by heating with S at  $250^\circ$  until  $\text{H}_2\text{S}$  ceases to be evolved, yields *1,2,3,4-dibenzoylene-1,4,5,6-tetrahydropyrazine* (V), brownish orange needles, m.  $202-3^\circ$ . This



substance which is more easily obtained by heating a mixt. of phthalide,  $\text{C}_6\text{H}_4(\text{NH}_2)_2$  and S in a sealed tube at  $250^\circ$ , is oxidized to diphthalylethylenediimide by  $\text{CrO}_3$  and AcOH.  $\text{C}_6\text{H}_4(\text{NH}_2)_2$  (anhydrous or in 50% aq. soln.) reacts vigorously with the lactone of *o*- $\text{HOC}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$  (2 mols.) and it is preferable to add alc. as a diluent; the product is *N,N'*-ethylenebis-[*o*-hydroxyphenylacetamide],  $\text{C}_6\text{H}_4(\text{NHCOCH}_2\text{C}_6\text{H}_4\text{OH})_2$ , needles, m.  $208^\circ$ , which forms a *diphenylurethan*,  $\text{C}_{22}\text{H}_{18}\text{O}_4\text{N}_4$ , needles, m.  $225^\circ$ . Still more vigorously react 50% aq.  $\text{C}_6\text{H}_4(\text{NH}_2)_2$  and the lactone of *o*- $\text{HOC}_6\text{H}_4\text{CHPhCO}_2\text{H}$ , and alc. must be added to keep the reaction under control. The product is *N-o*-hydroxydiphenylacetylene-diamine,  $\text{HOC}_6\text{H}_4\text{CHPhCONHCH}_2\text{CH}_2\text{NH}_2$ , needles, decomp.  $197^\circ$ , whether 1 or 2 mols. of the lactone is present. C. J. WEST.

**Theory of ring closure.** RICHARD MEYER AND HERMANN LÜDERS. *Ann.* 415, 29-50 (1918); *J. Chem. Soc.* 114, I, 450-2.—Since Thiele and Falk have shown that Anderlini's so-called *o*-phenylenephthalamide prepd. from *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$  and  $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  is really 2-carboxyphenylbenziminazole, M. and L. have reinvestigated the action of *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$  with succinic acid and find that 2 compds. only are formed, not 3 as stated previously, the substance, m.  $236^\circ$ , supposed to be the 8-ring *o*-phenylenesuccinamide, being identical with benziminazole-2-propionic acid. It yields a *methyl ester*, quadratic leaflets, m.  $144-5^\circ$ ; *ethyl ester*, needles, m.  $135-6^\circ$ , and *amide*, prismatic needles, m.  $254^\circ$  (decompn.). The *silver salt*, small prisms, *copper salt*, blue plates, and *chloroplatinate*, yellow crystals, are described, and also the *chloroaurate of the methyl ester*. By heating at  $230-40^\circ$ , it loses  $\text{H}_2\text{O}$  and yields *1,2-propionylenebenziminazole*,



needles, m.  $170^\circ$ . Since, therefore, the compds. obtained from *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$  and  $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  and succinic acid, resp., are 5-ring, not 8-ring compds., the behavior of

the diamine with other dibasic acids requires reinvestigation. Cox (*Diss.*, Strassburg, 1908) has already shown that the product from the diamine and malonic acid is easily split into its generators, does not contain a  $\text{CO}_2\text{H}$  group and is the 7-membered ring *o*-phenylenemalonamide, as stated by Meyer. It is now shown that the product from  $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$  and Et isosuccinate behaves similarly and is, as stated previously, the 7-ring *o*-phenyleneisosuccinamide, although its infusibility and sparing soly. suggests that the mol. is polymerized. The reactivity of the methine H atom in Et isosuccinate has been investigated. No reaction occurs with  $\text{HCHO}$  or  $\text{BzH}$ , and the Na deriv. of the ester does not yield condensation products with  $(\text{CH}_3\text{COCl})_2$  or  $o\text{-C}_6\text{H}_4(\text{COCl})_2$ , but reacts with  $\text{BzCl}$  and with  $\text{PhCH:CHCOCl}$  in dry  $\text{Et}_2\text{O}$  to form *ethyl  $\alpha$ -benzoylisosuccinate*,  $\text{CMeBz}(\text{CO}_2\text{Et})_2$ , small, quadratic plates, m.  $36\text{--}8^\circ$ ,  $b_{11}$   $193\text{--}5^\circ$ , and *ethyl  $\alpha$ -cinnamylisosuccinate*, a pale yellow viscous liquid,  $b_{11}$   $225\text{--}30^\circ$ , resp. Isosuccinic acid and  $\text{BzOH}$  or cinnamic acid are obtained when attempts are made to hydrolyze the esters and the reaction with  $\text{PhNHNH}_2$  results in the formation of Et isosuccinate and  $\text{PhNHNHBz}$ . When heated slowly, *m*-nitrophthalanilic acid apparently m.  $240^\circ$  (Meyer) but when heated rapidly it m.  $202^\circ$  with violent foaming (Tingle and Rolker), resolidifies and m. again  $240^\circ$ . This phenomenon is due to the conversion of the anilic acid into the anil, which m.  $240\text{--}2^\circ$ . The anilic acid crystals in colorless needles, not faintly yellow, as previously stated by Meyer. The fusion of *p*-nitrophthalanilic acid is similar; at  $190\text{--}2^\circ$  fusion occurs with violent foaming, and the product resolidifies, and m. again  $260^\circ$ , the m. p. of the anil. *o*-Nitrophthalanilic acid, yellow leaflets, m.  $146\text{--}8^\circ$  (without decompn.) but at  $190\text{--}200^\circ$  it loses  $\text{H}_2\text{O}$  and yields the anil, needles m.  $200\text{--}1^\circ$ . *m*-Nitrosuccinanilic acid m.  $179^\circ$ , and the anil at  $174^\circ$ . C. J. WEST.

Action of the chlorides of phosphorus on phenolsulfonic acids. II. RICHARD ANSCHUTZ AND EUGEN MOLINEUS. *Ann.* 415, 51–64(1918); *J. Chem. Soc.* 114, I, 423.—*p*-Chlorosulfonyl dichloro-orthophosphate,  $\text{ClO}_2\text{SC}_6\text{H}_4\text{OPOCl}_2$ , is converted by heating with an equimol. quant. of  $\text{PCl}_5$  at  $180^\circ$  into *p*- $\text{ClC}_6\text{H}_4\text{OPOCl}_2$ , and the latter, treated similarly at  $250^\circ$ , is converted quant. into *p*- $\text{C}_6\text{H}_4\text{Cl}_2$ . *p*-Chlorosulfonylphenyl metaphosphate,  $\text{ClO}_2\text{SC}_6\text{H}_4\text{OPO}_3$ , obtained by heating the corresponding dichloride with the calcd. amt. of  $\text{H}_2\text{O}$  (weighed in the form of anhydrous  $(\text{CO}_2\text{H})_2$ ), forms transparent crystals and is converted into *p*-chlorosulfonylphenyl hydrogen phosphate on exposure to moisture in the air. Potassium *p*-acetoxybenzenesulfonate,  $\text{KO}_2\text{SC}_6\text{H}_4\text{OAc}$ , crystals, prep'd. by heating *p*- $\text{HOC}_6\text{H}_4\text{SO}_3\text{K}$  with  $\text{Ac}_2\text{O}$  at  $150^\circ$ , is converted by  $\text{PCl}_5$  on the  $\text{H}_2\text{O}$  bath into *p*-acetoxybenzenesulfonyl chloride, crystals, m.  $78^\circ$ ,  $b_{11}$   $148^\circ$ , which reacts in  $\text{Et}_2\text{O}$  with  $\text{PhNH}_2$ , *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ , and piperidine (2 mols.) to form the *anilide*, m.  $126\text{--}7^\circ$ , *p*-toluidide, m.  $98\text{--}9^\circ$ , and *piperidide*, m.  $115\text{--}6^\circ$ , resp. These 3 substances are converted by heating with alc. (the 1st requires KOH in addition) into *phenol-p-sulfonanilide*, needles, m.  $137\text{--}8^\circ$ , *p*-toluidide, needles, m.  $151\text{--}2^\circ$ , and *piperidide*, m.  $132\text{--}3^\circ$ , resp. When heated with  $\text{CCl}_4$  and  $\text{PCl}_5$  at  $180\text{--}200^\circ$ ,  $2,6,4\text{-Br}_3(\text{ClO}_2\text{S})\text{C}_6\text{H}_3\text{OPOCl}_2$  is converted into *4-chloro-3,5-dibromobenzenesulfonyl chloride*,  $\text{C}_6\text{H}_2\text{ClBr}_2\text{SO}_2\text{Cl}$ , crystals, m.  $94.5^\circ$ , and this is converted into  $1,2,4,6\text{-C}_6\text{H}_2\text{Cl}_4$  by  $\text{PCl}_5$  at  $200^\circ$ .

C. J. WEST.

Sulfonylides. RICHARD ANSCHUTZ. *Ann.* 415, 64–97(1918); *J. Chem. Soc.* 114, I, 424–5.—(With CLARA ZYMANDL.) *o*-Chlorosulfonylphenyl dichloro-orthophosphate,  $\text{ClO}_2\text{S.C}_6\text{H}_3\text{OPOCl}_2$ , yellow oil, b.  $185^\circ$ , obtained from  $2\text{-HOC}_6\text{H}_3\text{SO}_3\text{Na}$  and  $\text{PCl}_5$  (rather more than 1 mol.), is converted by heating with  $\text{PCl}_5$  at  $150^\circ$  into *o*-chlorophenyl dichloro-orthophosphate, pale yellow oil,  $b_{11}$   $135\text{--}7^\circ$ , which yields *o*- $\text{ClC}_6\text{H}_4\text{OH}$  by boiling with  $\text{H}_2\text{O}$ , and *o*- $\text{C}_6\text{H}_4\text{Cl}_2$  by heating with  $\text{PCl}_5$  at  $250^\circ$ . Sodium acetoxybenzenesulfonate,  $\text{AcOC}_6\text{H}_5\text{SO}_2\text{Na}$ , obtained by heating the  $\text{HOC}_6\text{H}_5\text{SO}_3\text{Na}$  with  $\text{Ac}_2\text{O}$ , is converted by  $\text{PCl}_5$  into *acetoxybenzene-o-sulfonyl chloride*, colorless crystals, m.  $73.2\text{--}3.9^\circ$ , which yields the *sulfonanilide*,  $\text{AcOC}_6\text{H}_5\text{SO}_2\text{NHPh}$ , m.  $106\text{--}7^\circ$ , and *sulfono-p-toluide*,

leaflets, m.  $116-7^{\circ}$ , by treatment with  $\text{PhNH}_2$  and  $p\text{-MeC}_6\text{H}_4\text{NH}_2$ , resp.; these are hydrolyzed, the latter by boiling alc. KOH, yielding *phenol-o-sulfonanilide*,  $\text{HOC}_6\text{H}_4\text{SO}_2\text{NHPh}$ , leaflets, m.  $124-5^{\circ}$ , each of which develops a violet color with alc.  $\text{FeCl}_3$ . Phenylene-*o*-sulfonylide is produced when a soln. of acetoxybenzene-*o*-sulfonyl chloride is treated with ethereal gaseous  $\text{NH}_3$  or with an ethereal solution of  $\text{Et}_3\text{NH}$ ,  $\text{AcCl}$  being eliminated. (With L. HODGENIUS.)—Sodium 4-acetoxytoluene-3-sulfonate, prepd. from *p*-cresolsulfonate and  $\text{Ac}_2\text{O}$ , is converted by  $\text{PCl}_5$  into 4-acetoxytoluene-3-sulfonyl chloride, m.  $55-6^{\circ}$ , b<sub>10</sub>  $165-70^{\circ}$ , which yields tolylene-3,4-sulfonylide by treatment with ethereal  $\text{NH}_3$  or  $\text{Et}_3\text{NH}$ . The following three compds. are prepd. by methods similar to the preceding: sodium 4-acetoxytoluene-3,5-disulfonate, 4-acetoxytoluene-3,5-disulfonyldiethylamide,  $\text{AcOC}_6\text{H}_2\text{Me}(\text{SO}_2\text{NEt}_2)_2$ , crystals, m.  $150^{\circ}$ , and 4-acetoxytoluene-3,5-disulfonyl chloride, crystals, m.  $115^{\circ}$ . Tolylene-3,4-sulfonylide-5,5'-disulfonic acid,  $\text{HO}_3\text{SC}_6\text{H}_2\text{Me}:(\text{OSO}_2)_2:\text{C}_6\text{H}_2\text{MeSO}_3\text{H}\cdot 3\text{H}_2\text{O}$ , is prepd. by treating *p*-cresol-3,5-disulfonic acid with fuming  $\text{H}_2\text{SO}_4$  (60%  $\text{SO}_3$ ), finally at  $100^{\circ}$  with the further addition of the fuming acid and recrystg. the ppt. from dil.  $\text{HNO}_3$ ; it forms a K salt, long needles with 5.5  $\text{H}_2\text{O}$ , a silver salt, needles, and a ferric salt, needles, and when anhydrous reacts with  $\text{PCl}_5$  to form tolylene-3,4-sulfonylide-5,5'-disulfonyl chloride, crystals, decomp. about  $280^{\circ}$ , which is stable to boiling  $\text{H}_2\text{O}$ . 4-*tert*-butylphenol-3-sulfonic acid,  $\text{Me}_3\text{CC}_6\text{H}_4(\text{OH})\text{SO}_3\text{H}$ , is obtained by heating *p*-*tert*-butylphenol with pure  $\text{H}_2\text{SO}_4$  at  $70-80^{\circ}$ . Its sodium salt, anhydrous crystals, yields by acetylation sodium 4-acetoxy-1-*tert*-butylbenzene-3-sulfonate, which is converted by  $\text{PCl}_5$  on the  $\text{H}_2\text{O}$  bath into 4-acetoxy-1-*tert*-butylbenzene-3-sulfonyl chloride, crystals, m.  $103^{\circ}$ . *tert*-Butylphenylene-3,4-sulfonylide,  $(\text{Me}_3\text{CC}_6\text{H}_4:\text{OSO}_2)_2$ , microscopic needles, m.  $301-2^{\circ}$ , is obtained by the action of  $\text{POCl}_3$  on 1,4-*tert*-butylphenol-3-sulfonic acid. The following amyl compds. are prepd. like the corresponding Bu compds.: 1,4-*tert*-amylphenol-3-sulfonic acid, and its sodium salt, sodium-4-acetoxy-1-*tert*-amylbenzene-3-sulfonate, 4-acetoxy-1-*tert*-amylbenzene-3-sulfonyl chloride, b<sub>14</sub>  $142-6^{\circ}$ , and *tert*-amylphenylene-3,4-sulfonylide, crystals, m.  $228-9^{\circ}$ . The substance obtained by Schiff (Ann. 178, 187(1875)) by treating sulfotannic acid or its Ac deriv. with  $\text{Ac}_2\text{O}$  is 5,6-diacetoxy-*o*-phenylenesulfonylide. (With MARIA MAXIM.) Sodium 2-acetoxynaphthalene-1-sulfonate, faintly red needles, prepd. by acetylating the naphtholsulfonate, is converted by  $\text{PCl}_5$  in the presence of  $\text{CHCl}_3$  into 2-acetoxynaphthalene-1-sulfonyl chloride, crystals, m.  $115^{\circ}$ , which cannot be converted into a sulfonylide by means of  $\text{C}_6\text{H}_5\text{N}$ ; neither can 2-naphthol-1-sulfonyl chloride, needles, m.  $124^{\circ}$ , obtained by hydrolyzing the Ac deriv. with warm dil. NaOH. The following derivs. of  $1,2\text{-C}_{10}\text{H}_6(\text{OH})\text{SO}_3\text{H}$  can be obtained by methods similar to those already described: potassium 1-acetoxynaphthalene-2-sulfonate, prisms, 1-acetoxynaphthalene-2-sulfonyl chloride, cryst. powder, m.  $87.5^{\circ}$ , 1-acetoxynaphthalene-2-sulfonamide, stout yellow needles, without a sharp m. p., and the corresponding sulfonanilide,  $\text{AcOC}_{10}\text{H}_6\text{SO}_2\text{NHPh}$ , crystals, m.  $157.5^{\circ}$ , and sulfono-*p*-toluidide, m.  $135.5^{\circ}$ . 2,1-Naphthalenesulfonylide, cryst. powder, decomps. above  $300^{\circ}$ , is obtained (1) by adding  $\text{POCl}_3$  to a mixt. of  $1,2\text{-C}_{10}\text{H}_6(\text{OH})\text{SO}_3\text{K}$ ,  $\text{C}_6\text{H}_5\text{N}$  and  $\text{CHCl}_3$  with cooling, (2) by shaking  $1,2\text{-C}_{10}\text{H}_6(\text{OAc})\text{SO}_2\text{Cl}$  with  $\text{C}_6\text{H}_5\text{N}$  at ordinary temp. 2,1- $\text{C}_{10}\text{H}_6(\text{OH})\text{SO}_3\text{Na}$  yields 2-naphthol-1,3,6,7-tetrasulfonic acid by heating with 4 parts of fuming  $\text{H}_2\text{SO}_4$  (40% of  $\text{SO}_3$ ) at  $120-30^{\circ}$  for 8 hrs., but when heated with 5 parts for 2 days is converted into a substance, crystals, which appears to be 3,2-naphthylenesulfonylide-1,6,7,1',6',7'-hexasulfonic acid (sodium salt,  $\text{C}_{10}\text{H}_2\text{O}_{12}\text{S}_6\text{Na}$ , prismatic needles). Acetylisethionyl chloride,  $\text{AcOCH}_2\text{CH}_2\text{SO}_2\text{Cl}$ , b<sub>14</sub>  $130-2^{\circ}$ , obtained together with  $\text{ClCH}_2\text{CH}_2\text{SO}_2\text{Cl}$ , by heating  $\text{AcOCH}_2\text{CH}_2\text{SO}_3\text{K}$  with  $\text{PCl}_5$  on the  $\text{H}_2\text{O}$  bath, cannot be converted into the sulfonylide by means of  $\text{NH}_3$  or  $\text{Et}_3\text{NH}$ ; the sulfonylide also cannot be prepd. from the acid and  $\text{P}_2\text{O}_5$  or  $\text{POCl}_3$ . C. J. Wgstr.

Effects of ring closure on spectrochemical properties. I. Saturated iso- and heterocyclic compounds, unsaturated isocyclic substances and the question of the



constitution of benzene. K. VON AUWERS. *Ann.* 415, 98-168(1918); *J. Chem. Soc.* 114, II, 343.—A. surveys a large field of material and arrives at the following generalizations: Compds. the mols. of which contain 1 or more rings (isocyclic or heterocyclic) without linkings of any kind are optically normal; only when the ring is under tension do the mol. refraction and dispersion exhibit exaltation or depression. The spectrochem. character is unchanged when a satd. side-chain closes to form a ring; e. g., the pairs *o*-MeC<sub>6</sub>H<sub>4</sub>OMe and coumaran and *o*-MeC<sub>6</sub>H<sub>4</sub>OEt and chroman are optically identical and the same holds for a large number of other coumarans and phenolic ethers. The closure of an unsatd. side-chain to a ring causes a weakening of the optical properties, which is the more pronounced the more unsatd. the chain; e. g., styrene deriv. and indene deriv., acyclic dienes and cyclic dienes and acyclic trienes and cyclic trienes. Alkyl groups and other substituents produce an effect opposed to that of ring closure in unsatd. compds. Exceptions occur to all of these generalizations. Contrary to earlier views, double linkings in open and in closed chains are not optically equiv., the spectrochem. effect of the cyclic double linkings being quite generally slighter than that of ethylenic linkings. The 2 physico-chem. methods of investigation, spectrochemistry and thermochemistry, both decide against the view that C<sub>6</sub>H<sub>6</sub> and its hydrogenated derivs. are different in their innermost structure and all the physical and chem. facts ally themselves best to a C<sub>6</sub>H<sub>6</sub> formula containing 3 double linkings. The densities and refractive indices of a number of compds. have been redetd. and new detns. have been made in the case of a large number of coumarans, chromans, phenolic ethers, ketones and indene derivs. The following new substances are described: *as-m-xylyl ethyl ether*, b. 202-3°, d<sub>4</sub><sup>13.96</sup> 0.9487, n<sub>D</sub> 1.50297, n<sub>D</sub> 1.50692, n<sub>B</sub> 1.51874, n<sub>γ</sub> 1.52872 at 13.95°. *5-Bromo-*o*-tolyl ethyl ether*, b. 238-40°, d<sub>4</sub><sup>11.36</sup> 1.3592, n<sub>D</sub> 1.54387, n<sub>γ</sub> 1.54858, n<sub>B</sub> 1.56186, n<sub>γ</sub> 1.57332. *6-Ethoxy-*m*-toluic acid*, needles, m. 200-1°. *Ethyl 6-ethoxy-*m*-toluate*, b. 274-5°, d<sub>4</sub><sup>16.1</sup> 1.0618, n<sub>D</sub> 1.51443, n<sub>D</sub> 1.51908, n<sub>B</sub> 1.53259, n<sub>γ</sub> 1.54428 at 15.1°. *1-Methyl-ac-tetrahydro- $\alpha$ -naphthol*, leaflets, m. 88-9°.

C. J. WEST.

Spectrochemistry and determination of the constitution of tautomeric compounds. K. VON AUWERS. *Ann.* 415, 169-232(1918); *J. Chem. Soc.* 114, II, 381-2.—Brühl showed more than 30 yrs. ago that mol. refraction and dispersion can be utilized to differentiate between enolic and keto-modifications, but the detn. in recent times of the compn. of the keto-enol mixt. by chem. means had frequently led to results which are quite opposed to Brühl's views. A. has undertaken a series of researches, of which this is the first, to ascertain how far spectrochemistry in its present state can be applied to investigations of desmotropic compds. With the difference in structure represented by the scheme —COCHR, —C(OH)CR, correspond const. differences in the mol. refraction and dispersion of such magnitude that a trustworthy decision between the 2 structures can be made only when homogenous substances are in question; also the % compn. of mixts. of simple enols and ketones, e. g., a simple unsatd. alc. and the isomeric aldehyde or ketone, can be ascertained with satisfactory accuracy by the refractometric method, especially if the sp. refraction and dispersion are employed instead of the mol. magnitude. Errors arise, however, and false conclusions may be drawn when certain groups are present in the mol. E. g., in  $\beta$ -diketones,  $\beta$ -ketonic acids, etc., occur the systems —COCHRCOR'— and OHC:CRCR':O. The former is spectrochem. normal, but the latter, containing a conjugate system of linkings, exhibits an abnormal increase of the refraction and still more so of the dispersion. Almost the only possible way of overcoming this difficulty is the calcn. of the magnitude of the exaltation by means of known regularities. Eisenlohr and Auwers have shown that the magnitudes of the sp. exaltations of the refraction and dispersion remain practically const. in compds. containing the same conjugate system, so that "normal values" of

the sp. exaltations can be recorded. Unfortunately, this regularity is not equally sharp for all classes of substances, possibly on account of exptl. error or lack of purity of the compds. examd. It is necessary, therefore, to det. more accurately than hitherto the normal values of the sp. exaltations for the conjugate systems  $-\text{CH}:\text{CH}:\text{CR}:\text{O}$ , and  $-\text{CH}:\text{CH}(\text{COR}):\text{O}$ , and to ascertain the influence of disturbing substituents on these values. By means of the numbers so obtained, the theoretical values of the mol. refraction and dispersion of the enols can be calcd. and thus the foundations laid for a more trustworthy detn. of the equil. proportions of enolic and keto-modifications by means of the optical constns. A. then discusses the values obtained for series of hydroxymethylene compds. and their ethers and esters and draws the conclusion that a trustworthy calcn. of the real mol. refraction and dispersion of enols is possible at the present time in only a few cases in which specially favorable comparison material is available. The following substances have been examd.: The % are calcd. from the spectrochem. data and the figures in parentheses are the % found by Meyer's Br method. Et diacetoacetate, % of keto-enol, 100 (90-100); acetylacetone, enol 69% (76); methylacetylacetone, keto-enol 38 and 31% in 2 different preps. (31); Et acetylmalonate, enol 70% (64); Me benzoylacetate, enol 25% (16.7); Et benzoylacetate, enol 29% (29); Et  $\alpha$ -benzoylbutyrate, enol at most a few units %; methylbenzoylacetone, enol 22% (6). The spectrochem. constns. (density and refractive indices for the  $\alpha$ , D,  $\beta$  and  $\gamma$  lines) have been detd. of the following hydroxymethylene compds. and their Et ethers and esters:  $\gamma$ -keto- $\beta$ -methyl- $\Delta^2$ -penten- $\alpha$ -ol; hydroxymethylene-pinacoln (*ethyl ether*,  $b_{18}$  103-4°; acetate, rhombohedral plates, m. 44-5°,  $b_{18}$  118-8.5°); 2-hydroxymethylenementhone; 2-hydroxymethylenecyclohexanone (*ethyl ether*,  $b_{18}$  128.2-8.4°; acetate,  $b_{14}$  142-3°); Et  $\beta$ -acetoxyacrylate; Et  $\beta$ -hydroxy- $\alpha$ -methylacrylate; Et hydroxymethyleneacetoacetate; Et hydroxymethylenemalonate. The constns. are also given for the following diketones and ketonic esters: acetylacetone (and *O*-methyl (and ethyl ethers); methylacetylacetone; dimethylacetylacetone; ethylacetylacetone; methylbenzoylacetone (and the *O*-methyl ether),  $\beta$ -methoxy- $\beta$ -amylacrylic acid and its Me ether; Et  $\beta$ -ethoxy- $\beta$ -amylacrylate; Et *O*-acetylacetoacetate; Et diacetoacetate; Me benzoylacetate and the Et ester; Et ethylbenzoylacetate.

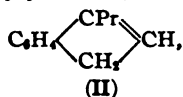
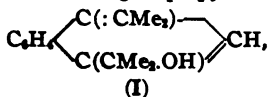
C. J. WEST.

Colored acid additive products of unsaturated ketones. FRITZ STRAUS AND HUGO BLANKENHORN. *Ann.* 415, 232-56(1918); *J. Chem. Soc.* 114, I, 501.—Mylo has shown that the acetals of aldehydes react with  $\text{PCl}_5$ ,  $\text{SOCl}_2$ , etc., an alkyloxy group being replaced by Cl. It is now shown that acetals of certain unsatd. ketones in  $\text{C}_6\text{H}_6$  soln. react with HCl or, better, with  $\text{PCl}_5$  (1 mol.) in the same way; the products are isolated in the form of yellow- or orange-red complex compds. with  $\text{PCl}_5$  or  $\text{HgCl}_2$ . Thus the acetal of cinnamylidenemethyl phenyl ketone in  $\text{C}_6\text{H}_6$  soln. is treated with  $\text{PCl}_5$  dissolved in  $\text{C}_6\text{H}_6$ , and to the cooled, clear, faintly colored soln. is added, drop by drop, with complete exclusion of  $\text{H}_2\text{O}$ , a soln. of  $\text{HgCl}_2$  in dry  $\text{Et}_2\text{O}$ , whereby the additive compound,  $\text{CHPh}:\text{CHCH}:\text{CHCPhClOMe}.\text{HgCl}_2$ , m. about 110° (decompn.), is pptd. as a red oil, which rapidly solidifies and becomes cryst. In a similar way the acetal of phenyl styryl ketone,  $\text{CHPh}:\text{CHCPh}(\text{OMe})_2$ , needles, m. 46-6.5°, yields the substance,  $\text{CHPh}:\text{CHCPhClOMe}.\text{HgCl}_2$ , yellow crystals, m. about 100° (decompn.); the acetal of *p,p'*-dimethoxybenzophenone, needles, m. 107-8°, yields the substance,  $\text{MeOCCl}(\text{C}_6\text{H}_4\text{OMe})_2.\text{HgCl}_2$ , yellow apparently amorphous powder, and the acetal of benzophenone yields the substance  $2\text{CPh}_2\text{ClOMe}.\text{HgCl}_2$ , almost colorless needles. The substances are converted into the original ketones by hydroxylic solvents, into the original acetals by alc.  $\text{MeONa}$ , and evolve  $\text{MeCl}$  when heated. The bearing of the preceding substances on the constitution of the colored acid additive compds. of the ketones is discussed. The following substances are described: *p*-Chlorophenyl  $\alpha$ -methoxystyryl

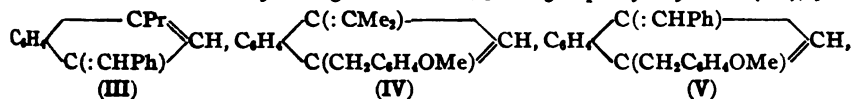
ketone,  $\text{MeOC}_6\text{H}_4\text{CH:CHCOC}_6\text{H}_4\text{Cl}$ , yellow needles, m.  $121-2^\circ$ , prepd. from anisaldehyde and  $p\text{-ClC}_6\text{H}_4\text{COMe}$  in aq. alc. containing about 0.5% NaOH. *p*-Anisyl *p*-chlorostyryl ketone, pale yellow crystals, m.  $130-1^\circ$ . *p*-Anisyl *p*-chlorocinnamylidene-methyl ketone, yellow needles, m.  $140^\circ$ . *p*-Chlorophenyl *p*-methoxycinnamylidene-methyl ketone, golden yellow needles, m.  $156^\circ$ ; and *p*-chlorodistyryl ketone, pale yellow needles, m.  $134^\circ$ .

C. J. WEST.

**Derivatives of fulvene. V. Condensation of indene with ketones.** JOHANNES THIELE AND KARL MERCK. *Ann.* 415, 257-73 (1918); *J. Chem. Soc.* 114, I, 484-6. —The reactivity of the  $\text{CH}_2<$  group in cyclopentadiene, indene, and fluorene decreases as the ethylenic linkings of the 5-ring become double linkings in a  $\text{C}_6\text{H}_4$  nucleus. It has already been shown that cyclopentadiene condenses extraordinarily easily with ketones, while fluorene does not condense at all under the influence of alk. condensing agents. The behavior of indene has now been examd. It condenses easily with acetone in the presence of  $\text{MeOH-KOH}$ , yielding, after boiling for 2 hrs., dimethylbenzofulvene (*picrate*, yellow needles, m.  $115-6^\circ$ , sintering at  $102^\circ$ ) but at the ordinary temp., after a week, a mixt. of this and  $\omega, \omega$ -dimethyl-3- $\alpha$ -hydroxyisopropylbenzofulvene (I), m.  $97-8^\circ$ . Dimethylbenzofulvene is not reduced by Al-Hg and moist  $\text{Et}_3\text{O}$ , but is smoothly converted into 3-isopropylindene (II), faintly yellow oil, b. about  $230^\circ$  (de-



compu.), b.  $113^\circ$ , by Na and boiling abs. alc. Indene condenses less readily with aromatic ketones than with acetone. By prolonged boiling with  $\text{BzMe}$  and alc.  $\text{NaOEt}$ , it yields  $\omega$ -phenyl- $\omega$ -methylbenzofulvene, yellow crystals, m.  $68-9^\circ$ , b.  $178-9^\circ$ , and by similar treatment it condenses with  $\text{Ph}_2\text{CO}$  to give  $\omega, \omega$ -diphenylbenzofulvene. These 2 substances are reduced by Al-Hg and moist  $\text{Et}_3\text{O}$  to 3- $\alpha$ -phenylethylidene (III), yel-



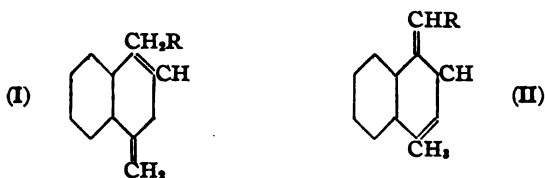
low needles, m.  $105.5^\circ$ , and the corresponding methoxybenzylidene compound, yellow crystals, m.  $81^\circ$ , resp. According to Thiele and Büchner's theory of the oscillating linking, the latter of these two compds. ought to be formed by the condensation of 3-*p*-methoxybenzylidene but the product proves to be 3-*p*-methoxybenzyl- $\omega, \omega$ -dimethylbenzofulvene (IV), faintly colored, felted needles, m.  $83^\circ$ . This, like other aliphatic fulvenes, is not reduced by Al-Hg but is converted by Na and boiling abs. alc. into *p*-methoxybenzylisopropylindene, pale yellow oil, b.  $200^\circ$ , which is also obtained by reducing 1-methoxybenzylidene-3-isopropylindene with Al-Hg and moist  $\text{Et}_3\text{O}$ . The condensation of  $\text{BzH}$  with 3-*p*-methoxybenzylidene and of anisaldehyde with 3-benzylidene has therefore been re-examd. and it is now found that the 2 reactions do not give rise to the same substances under suitable conditions. When the condensations are effected by the prolonged action of  $\text{MeOH-KOH}$  at the ordinary temp., the same product, 3-benzyl-1-*p*-methoxybenzylideneindene, is obtained in both cases, but when the 1st pair of substances is boiled with  $\text{MeOH-KOH}$ , for only 2 or 3 min., 3-*p*-methoxybenzyl-1-benzylideneindene, (V) yellow crystals, m.  $89-90^\circ$ , is obtained which readily changes to 3-benzyl-1-*p*-methoxybenzylideneindene by the further action of boiling  $\text{MeOH-KOH}$ . This compd. is not changed by prolonged boiling with  $\text{MeOH-KOH}$  and the same is the case with 3-*p*-methoxybenzyl- $\omega, \omega$ -dimethylbenzofulvene and with 1-*p*-methoxybenzylidene-3-isopropylindene. 3- $\alpha$ -Phenylethylindene (indenyl-methylphenylmethane) condenses with anisaldehyde in the presence of  $\text{MeOH-KOH}$  at the ordinary temp. to form a benzofulvene, yellow needles, m.  $121^\circ$ , but whether this



crystals, m.  $32^{\circ}$ . This with BzH yields 3-*p*-isopropylbenzyl-1-benzylideneindene, yellow needles, m.  $105-7^{\circ}$ . 3-Benzylindene and *p*-iso-PrC<sub>6</sub>H<sub>4</sub>CHO yield 3-benzyl-1-*p*-isopropylbenzylideneindene, yellow needles, m.  $93-4^{\circ}$ , which is converted into a mixt. of the 2 isomers, m.  $71-3^{\circ}$ , by prolonged boiling with MeOH-KOH (10 hrs.). 3-*p*-Chlorobenzylidene and BzH yield 3-*p*-chlorobenzyl-1-benzylideneindene, yellow needles, m.  $98-9^{\circ}$ , and 3-benzylindene and *p*-ClC<sub>6</sub>H<sub>4</sub>CHO yield 3-benzyl-1-*p*-chlorobenzylideneindene, yellow needles, m.  $88-9^{\circ}$ . The last compd. is converted, by boiling for 8 hrs. with MeOH-KOH, partly into a mixt., m.  $79-81^{\circ}$ , of the 2 isomers, and partly into 3-benzyl-1-*p*-chlorobenzylidene, needles, m.  $183-4^{\circ}$ , which is also produced by reducing the benzofulvene with Al-Hg and moist Et<sub>2</sub>O. 3-Methylbenzylidene and *p*-Cl-C<sub>6</sub>H<sub>4</sub>CHO yield 3-*p*-methylbenzyl-1-*p*-chlorobenzylideneindene, large yellow crystals, m.  $95-6^{\circ}$ , together with a small quantity of a substance, needles, m.  $181-3^{\circ}$ , which is probably 1-*p*-chlorobenzyl-3-*p*-methylbenzylidene. 3-*p*-Chlorobenzylidene and *p*-MeC<sub>6</sub>H<sub>4</sub>CHO yield a mixt. of a colorless substance, m.  $182-4^{\circ}$  (1-*p*-chlorobenzyl-3-*p*-methylbenzylidene) and a small quantity of a yellow substance, m.  $91-2^{\circ}$ , which appears to be 3-*p*-methylbenzyl-1-*p*-chlorobenzylideneindene, in a not quite pure state.

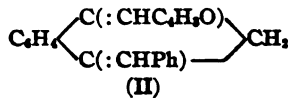
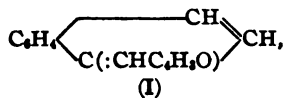
C. J. WEST.

**Isomerism of benzofulvenes and indenenes.** H. M. WÜRST. *Ann.* 415, 291-337 (1918); *J. Chem. Soc.* 114, I, 488-492.—With regard to the 8 pairs of isomerides described by Thiele and Merck and by Bernthsen (preceding abstrs.), no generalization in respect to the stability of 1 of the 2 isomers can be drawn, partly because no conclusions can be drawn from the nature of the groups introduced and partly because the transformation from 1 isomer into the other indubitably occurs only in 2 cases and fails entirely only in 2 other cases. A new series of benzofulvenes has, therefore, been examd. The simplest case of isomerism is represented by a 3-substituted benzofulvene (I) and the isomeric  $\omega$ -substituted 3-methylbenzofulvene (II). 3-Methylbenzo-



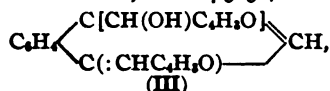
fulvene (II, R = H), an unstable, faintly yellow, intensely odorous oil,  $b_{11}$   $102-4^{\circ}$  (picrate, yellow needles, m.  $125.5-6.5^{\circ}$ ), is readily obtained by boiling a mixt. of 3-methylindene, (HCHO)<sub>3</sub>, abs. alc., and 28% MeOH-KOH for 12 min., but in no other case could a 3-substituted benzofulvene of type (I) be obtained, the product being always the  $\omega$ -substituted 3-methylbenzofulvene of type (II) owing to the isomerizing action of the alkali used as the condensing agent. Thus 3-benzylindene and (HCHO)<sub>3</sub> yield 1-benzylidene-3-methylindene (picrate, pale red needles, m.  $90-1^{\circ}$ ), 3-*p*-methoxybenzylidene and HCHO yield a mixt. of 1-*p*-anisylidene-3-methylindene and 1-*p*-anisylidene-3-ethylindene, C<sub>10</sub>H<sub>8</sub>O, yellow needles, m.  $100.5-1.5^{\circ}$  (neither of these is changed by boiling for 8 hrs. with MeOH-KOH), 3-methylindene and furfuraldehyde yield, after condensation with MeOH-KOH for 42 hrs. at the ordinary temp., 1-furfurylidene-3-methylindene, deep yellow needles, m.  $77-7.5^{\circ}$  (this compd., which forms a picrate, dark red needles, m.  $97-8^{\circ}$ , is also obtained by boiling 3-furylmethylindene, (HCHO)<sub>3</sub>, abs. alc. and MeOH-KOH for a few sec. and cooling rapidly) and 3-methylindene and Ph<sub>2</sub>CO yield diphenyl-3-methylbenzofulvene, yellow crystals, m.  $120-1^{\circ}$  (picrate, pale red needles, m.  $149-51^{\circ}$ ), the last condensation being effected by boiling with alc. EtOK for 17 hrs. The last mentioned benzofulvene is also obtained by boiling a mixt. of 3-benzhydrylidene, (HCHO)<sub>3</sub>, abs. alc. and MeOH-KOH for 1 hr. The preceding 4

benzofluvenes of type (II) are all intensely yellow and are reducible by Al-Hg and moist  $\text{Et}_2\text{O}$ . The reduction of  $\omega, \omega$ -diphenyl-3-methylbenzofluvene proceeds very slowly and incompletely, the product being 3-benzohydril-1-methylindene, needles, m. 162.5-3.5°. The groups Ph,  $p\text{-MeOC}_6\text{H}_4$ , benzohydril, and furyl in all possible pairs have been systematically introduced into the  $\omega$ - and the 3-positions in benzofluvene. The case of the pair Ph and  $\alpha\text{-MeOC}_6\text{H}_4$  has been investigated by Thiele and Merck; both isomerides are known, 3- $p$ -benzyl-1- $p$ -anisylideneindene being the more stable. Other pairs of isomers which exhibit transformation are the following: 3-Benzohydrilindene and BzH are condensed by MeOH-KOH, after 1 day at the ordinary temp., or after 30 sec. in the boiling soln., yielding 3-benzohydril-1-benzylideneindene, pale yellow needles, m. 131.5-2.5°. If the boiling is prolonged to 5 min., a difficultly separable mixt. of this and its isomer  $\omega, \omega$ -diphenyl-3-benzofluvene, deep yellow, quadratic leaflets, m. 130-0.5°, is obtained. The transformation is easily and completely effected by boiling a mixt. of 3-benzohydrilindene, BzH,  $\text{C}_6\text{H}_5\text{N}$  and MeOH-KOH for 1 min. This method of prepn. is much to be preferred to that in which 3-benzylindene and  $\text{Ph}_3\text{CO}$  are condensed by MeOH-KOH, since in the latter considerable quantities of  $\text{Ph}_3\text{CHOH}$  are formed. Thiele and Merck prepd. 3-benzohydril-1- $p$ -anisylideneindene at the ordinary temp. It is also obtained at the b. p. after 30 sec., but after boiling with alkali for 1 hr. in alc. or  $\text{C}_6\text{H}_5\text{N}$  soln. is transformed into  $\omega, \omega$ -diphenyl-3- $p$ -methoxybenzylbenzofluvene, yellow needles, m. 127-8°. The prepn. of the two following pairs of isomers, containing furyl and Ph or  $p\text{-MeOC}_6\text{H}_4$  groups, at first presented great difficulty, on account of the extreme ease with which the unstable isomer is converted into the stable one. 1-Furfurylideneindene ( $\omega$ -furylbenzofluvene) (I), yellow needles, m. 86-6.5° (picrate, red needles, m. 103-5°), prepd. from indene and furfuraldehyde in boiling MeOH-KOH (5 min.), is reduced by Al-Hg and moist  $\text{Et}_2\text{O}$  to furylmethylindene, almost colorless liquid with a pleasant, aromatic odor, b.p. 166-8°. From the last compd. and BzH 3-furylmethyl-1-benzylideneindene, yellow needles, m. 93-4.5° (clear at 98°), may be obtained merely by shaking with hot MeOH-KOH and immediately pouring the mixt. into  $\text{H}_2\text{O}$ . If the mixt. is boiled even for only 30 sec., the substance is transformed into 1-furfurylidene-3-benzylideneindene (II), faintly yel.



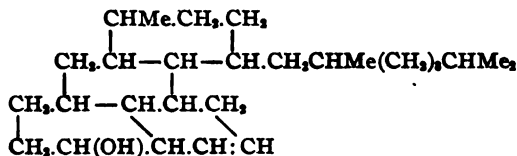
low needles, m. 160.5-1°, which by boiling with MeOH-KOH for 4 hrs. is converted into 1-furfurylidene-3-benzylidene, yellow needles, m. 126-7°; the last substance is obtained directly by the condensation of 3-benzylindene and furfuraldehyde. Using  $p\text{-MeOC}_6\text{H}_4\text{CHO}$  in place of BzH, the following substances are obtained by methods similar to the preceding: 1-Anisylidene-3-furylmethylindene, yellow leaflets, m. 88-9°, 1-anisylidene-3-furfurylideneindene, yellow needles, m. 150-0.5°, and 3- $p$ -methoxybenzyl-1-furfurylideneindene, golden yellow leaflets, m. 127-8°. The condensation of 3-benzohydrilindene and furfuraldehyde by MeOH-KOH, whether boiled for 3 sec. or for 1 hr., yields 3-benzohydril-1-furfurylideneindene, yellow needles, m. 170-0.5°, which is not changed by alkali or even in the presence of  $\text{C}_6\text{H}_5\text{N}$ . The isomer was not prepd. An examn. of all the preceding pairs of isomers shows that in every transformation the double linking shifts so that the partial valencies are balanced as much as possible and consequently the more satd. system is formed. In the 4 cases in which the substituents are a Me group and an aromatic group, the more satd. system is formed so easily that the more unsatd. isomer is unknown. When the substituents are 2 aromatic groups, a partial balance of the valencies occurs in both isomers and the transformation is rendered more difficult and leads to the formation of the isomer in which the exo-

cyclic double linking is conjugated with the more strongly unsatd. substituent. This isomer is therefore the more intensely colored of the pair. *1-Furfurylidene-3-furylhydroxymethylindene* (III), yellow needles, m. 114.5–5°, obtained by condensing indene



and furfuraldehyde by means of cold MeOH-KOH for 6 hrs., is reduced by Al-Hg and moist Et<sub>2</sub>O to *1,3-difurfurylideneindane*, faintly yellow needles, m. 132.5–3.5°, which is also obtained by boiling for 1 min. with alc. KOH. *3-furylmethyl-1-furfurylideneindene*, yellowish brown needles, m. 103–4°, prepd. from 3-furylmethylindene and furfuraldehyde. 3-Arylated benzofulvenes containing 2 aliphatic groups in the ω-positions are quite generally incapable of transformation. ω-Methyl-ω-ethylbenzofulvene, prepd. by boiling indene and MeEtCO with alc. KOH for 5 hrs., is a faintly yellow oil, b<sub>15</sub> 151–2° (*picrate*, orange needles, m. 87.5–88°) which is reduced by Na and abs. alc. to *3-isobutylindene*, oil, b<sub>15</sub> 116–8°. The last substance and Ph<sub>2</sub>CO condense when boiled for 23 hrs. with C<sub>6</sub>H<sub>5</sub>N and alc. KOH to form ω,ω-diphenyl-3-isobutylbenzofulvene, yellow needles or stout prisms, m. 91–2°. 3-Benzohydryl-ω-methyl-ω-ethylbenzofulvene, prepd. from 3-benzohydrylindene and MeEtCO by boiling 15 min. with alc. KOH, is a faintly yellow cryst. powder, m. 149–51°. 3-Isopropylindene and Ph<sub>2</sub>CO yield ω,ω-diphenyl-3-isopropylbenzofulvene, yellow cryst. powder, m. 127–8°. 3-Benzohydrylindene and Me<sub>2</sub>CO yield 3-benzohydryl-ω,ω-dimethylbenzofulvene, yellow cryst. powder, m. 174–5°. The reduction of 3-benzohydryl-1-benzylideneindene and of ω,ω-diphenyl-3-benzylbenzofulvene by Al-Hg and moist Et<sub>2</sub>O leads to the same product, namely, a mixt. of a substance, C<sub>21</sub>H<sub>24</sub>, hard crystals, m. 130–1°, and an isomeric substance, slender needles, m. 137–8°, which are the two benzylbenzohydrylindenes; also the reduction of ω,ω-diphenyl-3-isobutylbenzofulvene yields a mixt. of 2 isomers, *benzohydrylisobutylindene I*, needles, m. 121–3°, and *benzohydrylisobutylindene II*, slender needles, m. 94–5.5°. The latter is obtained from the former by boiling with alc. KOH for 30 min., and also from 3-benzohydryl-ω-methyl-ω-ethylbenzofulvene by reduction with Na and alc. The reduction of benzofulvenes in Et<sub>2</sub>O soln. with Pt black and H leads to the formation of indanes. Thus 3-benzohydryl-ω,ω-dimethylbenzofulvene yields 3-benzohydryl-1-isopropylindane, slender needles, m. 126.5–7.5°, and ω,ω-diphenyl-3-isobutylbenzofulvene yields 1-benzohydryl-3-isobutylindane, m. 104–5°. C. J. WEST.

Energetic oxidation of cholesterol by nitric acid. ADOLF WINDAUS. *Z. physiol. Chem.* 102, 160–5 (1918); *J. Chem. Soc.* 114, I, 500.—The following compds. have been recognized among the products of the oxidation of cholesterol by HNO<sub>3</sub>: dinitroisopropane, and AcOH, succinic, methylsuccinic and methylglutaric acids. Acetone, hydroxyisobutyric acid, methyl isohexyl ketone, and octane have been previously obtained, and W. points out that all the substances may be regarded as derived from an iso-octyl side chain in cholesterol. On this assumption, cholesterol may be represented by the formula:



C. J. WEST.

Conversion of levulose-diphosphoric acid into the corresponding monophosphoric acid. CARL NEUBERG. *Biochem. Z.* 88, 432–6 (1918); *J. Chem. Soc.* 114, I, 423.—This conversion can be brought about by gentle warming of a salt with N HCl or (CO<sub>2</sub>H)<sub>2</sub>.

The Ca salt of the monophosphoric acid has the formula  $C_6H_{11}O_7PCa.H_2O$ , and the Ba salt  $C_6H_{11}O_7PBa.H_2O$ . The monophosphate can be fermented by living yeast, whereas the diphosphate cannot. C. J. WEST.

**New  $\beta,\beta$ -dialkylglutaric acids.** I. GUARESCHI. *Atti r. accad. sci. torino* 53, 831-41 (1918).—These acids are of importance on account of their relation to the glutaric acid derivs. obtained by the scission of proteins, their isomerism with the higher homologs of  $(CH_2CO_2H)_2$  obtained in the oxidation of fats, and their relation to products obtained from camphor and santonin. The general method (*Atti r. accad. sci. torino* 36, (1901)) consists in the reaction of 1 mol. each of  $RR'CO$  and  $NH_3$  with 2 mols.  $NCCH_2CO_2Et$  to form  $RR'C[CH(CN)CO]_2NH$  and hydrolysis of this to give the  $RR'C(CH_2CO_2H)_2$ . 2 g.  $Pr_3C[CH(CN)CO]_2NH$  were boiled 3 hrs. with 30 cc. 60%  $H_2SO_4$ , solution with effervescence gradually taking place. Cooled, dild. with  $H_2O$ , and extd. with  $Et_2O$ , the mixt. yielded 1.55-1.6 g.  $\beta,\beta$ -dipropylglutaric acid, needles, m. 112-3°, m. under boiling  $H_2O$ ; the vapors cause coughing; a soln. of the  $NH_4$  salt gives microcryst. ppts. in the cold with  $AgNO_3$ ,  $CuSO_4$ , and  $Pb(OAc)_2$ , ppts. with  $ZnSO_4$  and  $FeCl_3$ , and with  $CaCl_2$  only on warming. The zinc salt was analyzed. Neutralization of this and other acids of this type with  $NH_3$  does not result in the liberation of  $C_2H_4$  or the corresponding hydrocarbon, as in the case of the  $\alpha,\alpha$ -dialkylglutaric acids (*Mem. r. accad. torino* 50, II, 268 (1901)) or the  $\beta,\beta$ -dialkyldicyanoglutarimides.  $\beta,\beta$ -Ethylpropylglutaric acid, yield 90%, needles or plates, m. 71-2°; silver salt.  $\beta,\beta$ -Methylisobutylglutaric acid, crystals, in almost quant. yield, m. 63-5°.  $\beta,\beta$ -Methylisohexylglutaric acid, in theoretical yield, crystals, m. 62-3°; silver and zinc salts.  $\beta,\beta$ -Methylnonylglutaric acid, from the dicyanoimide and 20 parts 60%  $H_2SO_4$  for 9 hrs., unctuous plates, m. 46.5-7.5°.  $\beta,\beta$ -Methylhexylglutaric acid, by hydrolyzing the imide for 4.5 hrs. and boiling the crude product again with 5 parts 60%  $H_2SO_4$  for 3 hrs., crystals, m. 52-3°. In passing from the  $Me_2$  to the  $Et_2$  and  $Pr_2$  derivs. an increase in m. p. of 4° is noted in each case. When 1 R is Me and the other increases the m. p. decreases, the MePr compd. being an exception M. HEIDELBERGER.

**A novel application of bromine water in synthetic organic chemistry.** JOHN READ AND MARGARET MARY WILLIAMS. *J. Proc. Roy. Soc. N. S. Wales* 51, 558-64 (1918).—When  $Br.H_2O$  is used as a test for the ethylenic linkage in org. substances, it is usually assumed that a di-Br compd. is the sole product. With  $H_3C:CH_2$ , however, 37.5% of the total Br was found to be converted to  $H_2CBrCH_2Br$ , 54.4% to  $H_2CBrCH_2OH$ , and 8.1% was eliminated as  $HBr$  (from decompn. of the  $HOBr$  formed during the reaction). When  $Br$  vapor was introduced into a soln. of  $PhCH:CHCO_2H$  in 30 times its wt. of ice-cold  $H_2O$ ,  $PhCH(OH)CHBrCO_2H$  (82.9%, relatively) and  $Ph(CHBr)_2CO_2H$  (17.1%) were the products. The latter was sepd. by filtration. The phenyl- $\alpha$ -bromolactic acid, extd. with  $Et_2O$  from the filtrate and crystd. from hot  $H_2O$ ,  $C_6H_6$ , or  $C_7H_8$ , m. 120-2°.  $AgNO_3$  pptd. the  $Ag$  salt from the  $H_2O$  soln. ( $Ag$ , 30.28% obtained; theory 30.68%) and  $Ph(CHBr)_2CO_2H$  added to the  $H_2O$  soln. caused the formation of  $Ph(CH)_2Br$ . When  $PhCH:CHCO_2Na$ , made from soln. of the acid in  $Na_2CO_3$ , was treated with  $Br$ , different results were obtained. A heavy oil and some crystals sepd.; the oil, extd. with light petroleum, was  $Ph(CH)_2Br$  (42.6%) and the crystals,  $Ph(CHBr)_2CO_2Na$  (4.6%). 52.8% of  $PhCH(OH)CHBrCO_2H$  was obtained. This method is a great improvement in prepg. the latter compd. which can be converted into  $PhCH_2CHO$  by treating successively with caustic alkali and dil.  $H_2SO_4$ . The value of the  $Br.H_2O$  method here described is in providing an efficient source of  $Br$  and  $HOBr$  and in connection with the prepn. of synthetic drugs. C. H. KIDWELL.

**Spectral analysis of the plant coloring matters of the flavone group.** I. Y. SHIBATA AND K. KIMOTSUKI. *J. Tokyo Chem. Soc.* 39, 771-808 (1918).—S. and K. studied the absorption spectra of the aq. soln. of flavone, apigenin, luteolin, galangine,



genperide, genperol, quercetin, myricetin, chrysin and their derivs. which show 2 absorption bands in the violet region in 0.0001 *N* soln. They came to the following conclusions: The introduction of a HO group into the benzene ring adjoining the pyrone ring as well as into the position next to the CO in pyrone ring, has a bathochrome effect on the first band  $\lambda = 3000$  in flavone, which is also affected hyperchromatically by the number of HO and MeOH groups in the benzene ring. The second band at 4000 is exhibited by all the compds. and is supposed to be due to the pyrone ring. The authors classified the coloring matters found in 19 plant specimens by applying these rules on the exts. from the plants and also confirmed the position of HO in the mol. of primetine found in *Primula farinosa* L. (yukiwariso) by studying its absorption curves.

S. KOMATSU.

**Synthesis of alkyl benzyl ketones.** III. A. OGATA. *Yakugaku-Zasshi* (J. Pharm. Soc. Japan) No. 441, 855-61 (1918).—By the method described in C. A. 12, 410, prepared *heptyl benzyl ketone*,  $b_{25} 165-9^\circ$ , and *pentadecyl benzyl ketone*, m.  $54-5^\circ$ . *Heptylbenzyl cyanide*,  $b_{21} 222-8^\circ$ ,  $\alpha$ -phenylheptylacetamide, m.  $111-2^\circ$  and *palmityl cyanide*, m.  $172-4^\circ$  and  $\alpha$ -phenylpalmitylacetamide, m.  $109-12^\circ$  were isolated as intermediate products. The yield of the cyanide decreased with increase of mol. wt. of both acids.

S. KOMATSU.

**The chemical constitution of squalene.** B. KUBOTA. *Tokyo Kwagaku Kwaishi* (J. Tokyo Chem. Soc.) 39, 879-907 (1918).—The present study was carried out to det. the constitution of the unsatd. hydrocarbon in shark-liver oil by studying the decompn. products of the ozonide. For this purpose, the material was prepd. from crude oil by Tsuzimoto's method (C. A. 10, 2989; 12, 1004). It  $b_{25} 284-5^\circ$ ,  $d_{15} 0.8596$ ,  $n_D^{15} 1.49595$ . Redistd. at 0.17 mm., it  $b_{0.17} 105^\circ$ ,  $d_{15} 0.86011$ ,  $n_D^{15} 1.4966$ . Through 14 g. pure oil dissolved in 70 cc.  $CHCl_3$ , was passed an  $O_3$ -air mixt. (5-7%) for 10 hrs. and the oil was allowed to stand in an ice-cooled room overnight. The filtrate from succinic acid sepg. in cryst. form was subjected to distn. at low pressure to remove the solvent; it yielded a viscous ozonide which was purified by pptn. with petr. ether, b.  $30-60^\circ$  from its  $Et_2O$  soln. The ozonide  $C_{30}H_{58}(O_3)_8$ , was decompd. with  $H_2O$  and the following substances were isolated from 27 g. oil or 45.95 g. ozonide:  $CO_2$  1.82 g.,  $CH_3O$ ,  $Me_2CO$  1.01, cyclodiacetone superoxide 0.7, levulinic aldehyde 0.68,  $HCO_2H$  0.84, levulinic acid 9.3, succinic acid 8.35, acid  $C_8H_{14}O_6$ , m.  $132-4^\circ$ , i.s., acid  $C_6H_{10}O_6$ , m.  $191-2^\circ$ , 0.5; total 24.7 g. From the data above mentioned, the author proposes the formula  $Me_2C:CH(CH_2)_2C(Me):CH(CH_2)_2CH:CH(CH_2)_6CH:CH(CH_2)_2CH:CH(CH_2)_2CMe:CH_2$  for squalene.

S. KOMATSU.

**The action of formic acid upon triarylcarbinols.** ADOLPHE KOVACHE. *Ann. chim.* 10, 184-248 (1918).—K. found that when  $Ph_3COH$  is boiled with pure  $HCO_2H$  it is quant. reduced to  $Ph_2CH$ . In order to ascertain the general applicability of this reaction it was applied to: (1) several derivs. of  $Ph_3COH$ ; (2) diphenylenphenylcarbinol and its derivs. (3) phenylxanthidrol and derivs. thereof; (4) some carbinols belonging to different groups of compds.; and (5) to some  $CH_2Ph_2$  and  $CHPh_3$  compds. It was found that whereas all of the compds., but one, of (1) were reduced quant. with  $HCO_2H$ , most of the others were so reduced only after the addition of  $HCO_2Na$ . In two cases, however, even the addition of  $HCO_2Na$  failed to give quant. results. The following compds. of group (1) were quant. reduced by means of  $HCO_2H$ : *o*- and *p*-methyl-, *p,p'*-dimethyl-, *p,p',p''*-trimethyl-, *o*-chloro-, *p*-methoxy- and *m*-nitrotriphenylcarbinols.  $1-C_{10}H_7CPh_2OH$  was quant. reduced only after the addition of  $HCO_2Na$ . Of groups (2) and (3), the following compds. were quant. reduced by boiling  $HCO_2H$  and  $HCO_2Na$ : 9-phenyl-, 9-*p*-tolyl-, 9-*p*-methoxy-, 9,1-naphthyl- and 9-benzylfluorenols and -xanthenols. Of group (4) the following were quant. reduced: 10-hydroxy-9,9,10-triphenyl- and 9,10-dihydroxy-9,10-diphenyl-9,10-dihydroanthra-

cenes and triphenylhydroxy- $\alpha,\alpha'$ -benzo- $\beta,\beta'$ -dihydro- $\alpha,\alpha'$ -furfurane. Benzhydrol even after 5 hrs. boiling was not completely reduced. Of group (5),  $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CHOH}$  was reduced quant.;  $(p\text{-Me}_2\text{NC}_6\text{H}_4)_2\text{CH}$  broke down quant. into 1 mol.  $\text{PhNMe}_2$  and 1 mol.  $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CH}_2$ ;  $(p\text{-Me}_2\text{NC}_6\text{H}_4)_2\text{CHPh}$  did not react quant. with  $\text{HCO}_2\text{H}$  and  $\text{HCO}_2\text{Na}$ ,  $\text{PhNMe}_2$  and  $\text{Me}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Ph}$  being identified as the reaction products;  $(p\text{-Me}_2\text{NC}_6\text{H}_4)_2\text{COH}$  was reduced quant., whereas  $(p\text{-Me}_2\text{NC}_6\text{H}_4)_2\text{CHOH}$  was not. In this entire investigation the quantitative estimations were made by absorbing with  $\text{KOH}$  and weighing the  $\text{CO}_2$  produced by the oxidation of the  $\text{HCO}_2\text{H}$ . No general satisfactory explanation of the favorable action of  $\text{HCO}_2\text{Na}$  is given. M. PHILLIPS.

**Manufacture of picric acid.** ALEXANDER MURRAY. *Color Trade J.* 4, 5-8(1919).—Fair yields of picric acid may be obtained under a variety of very flexible conditions. Under war conditions the process became standardized and may be carried out in small or large units, the latter being more economical in every way, and yields a more uniform product. In small units, nitrating pots of 60 to 70 gals. capacity are placed in batteries in such a manner that they can be warmed by steam pipes. Fifty lbs. of phenoldisulfonic acid are placed in each nitrator, dild. with 25 lbs. of  $\text{H}_2\text{O}$  with stirring, and covered. By means of a glass tube passing through the cover and dipping below the surface of the liquid, 90 lbs. of 75%  $\text{HNO}_3$  are run in slowly. A brisk reaction follows with the evolution of much red fumes and the temp. rises to  $115\text{--}20^\circ$ . At times foaming is troublesome, being caused by impurities in the acid used in sulfonating the phenol. By lab. control this source of loss may be avoided. The pots should be kept hot for 3 to 6 hrs. When fumes cease to come off the acid siphons are removed and the picric acid is stirred with a wooden paddle at hr. intervals as long as the temp. remains above  $108^\circ$ . Eight or 10 hrs. after nitration,  $\text{H}_2\text{O}$  is added and the dild. spent acid siphoned out and run to the concn. plant, while the crystals of picric acid are washed and dried in a centrifuge to 8% moisture. Large installations consist of a sulfonating tank holding, for example, 4166 lbs. of 92.7%  $\text{H}_2\text{SO}_4$  and 1000 lbs. of phenol, and provided with inlet pipes for steam coils, water, and air (for stirring). The mixt. is kept well agitated at  $50$  to  $70^\circ$  for 12 or, better, 24 hrs. For this reason it is best to have two sulfonators for each nitrator. Complete sulfonation is detd. by lab. test; then 2650 lbs. of  $\text{H}_2\text{O}$  is added with strong agitation and the mixt. is cooled to  $40\text{--}5^\circ$ . (Sulfonation may be effected with less  $\text{H}_2\text{SO}_4$  than given above, 2.5 to one phenol instead of 4 to 1 being used, and the amt. of  $\text{H}_2\text{O}$  changed in proportion.) The watered disulfonic acid and 5560 lbs. of mixed acid containing 15%  $\text{H}_2\text{SO}_4$  and 65%  $\text{HNO}_3$  are fed together into a mixing funnel from which they enter the nitrator. This requires about 2.5 hrs. Violent ebullition ensues, the temp. rising to  $114\text{--}9^\circ$ . The temp. is controlled by the amt. of  $\text{H}_2\text{O}$  previously added to the phenoldisulfonic acid. It is very important to use correct proportions, as the picric acid melts if the temp. goes above  $120^\circ$ , and gives a lumpy product. About an hour later the charge is stirred at intervals to prevent caking. The charge should be kept warm as long as possible and should stand at least 12 hrs. The contents of the nitrator are dild. with water, the spent acid is siphoned off and the picric acid washed and dried by the usual methods for handling large quantities. The  $\text{H}_2\text{SO}_4$  recovered by concg. the spent acid is not pure enough for sulfonation of the phenol, but can be used for other purposes about the plant. L. W. RIGGS.

**Identification of acids. IV. Phenacyl esters.** J. B. RATHER AND E. EMMET REID. *J. Am. Chem. Soc.* 41, 75-83(1919); cf. C. A. 11, 2579.—In addition to the *p*-nitrobenzyl esters described in the earlier papers, the phenacyl esters of a number of org. acids have now been prepd. in the hope that they also might be of use in the identification of acids, a hope which has been justified by expt. The presence of the ketone group in the esters gave promise that phenylhydrazones, oximes, semicarbazones, etc.,

might be prepd. and afford further means of identification; it was found, however, that the phenylhydrazones are not readily formed and that the oximes are difficult to purify and have low m. ps.; the semicarbazones have not yet been studied. The "reagent" used in the prepn. of the esters, *vis.*,  $\text{PhCOCH}_2\text{Br}$  (the chloride reacts much more slowly and gives lower yields), prepd. essentially by Möhlau's method (*Ber.* 15, 2464 (1882)), is obtained in 25–30 g. yield by slowly adding 28 g. Br to 20 g. BzMe in 30 g. glacial AcOH, pouring into ice water after the mixt. has begun to cool, letting stand 1 hr. and crystg. from alc.; it m.  $50^\circ$ . To prep. the esters slightly more than 0.005 equiv. acid and a little less than the equiv. amt. of  $\text{Na}_2\text{CO}_3$  are dissolved in hot  $\text{H}_2\text{O}$ , 1 g. of the bromide and 10 cc. of 95% alc. added and the heating is continued under a reflux 1, 2 and 3 hrs. for mono-, di- and tribasic acids, resp. (more alc. being added if necessary to prevent the ester from sepg. out); the soln. is then cooled rapidly under the tap and the crystals are filtered off with suction, washed twice with 5-cc. portions of alc. of the same strength as the reaction mixt. and then twice with  $\text{H}_2\text{O}$ . Recrystn. was repeated until const. m. ps. were obtained. The following *phenacyl esters* were so prepd.: Acetate, m.  $40^\circ$ ; aconitate, m.  $90^\circ$ ; *o*-aminobenzoate, m.  $181-2^\circ$ ; benzoate, m.  $118.5^\circ$ ; *p*-bromobenzoate, m.  $87^\circ$ ; cinnamate, m.  $140.5^\circ$ ; citraconate, m.  $108.5^\circ$ ; citrate, m.  $104^\circ$ ; *m*-cresotate, m.  $116.5^\circ$ ; *o*-cresotate, m.  $138.5^\circ$ ; *p*-cresotate, m.  $145.5^\circ$ ; fumarate, m.  $197.5^\circ$ ; glutarate, m.  $104.5^\circ$ ; itaconate, m.  $79.5^\circ$ ; lactate, m.  $96^\circ$ ; malate, m.  $106^\circ$ ; maleate, m.  $119^\circ$ ; mandelate, m.  $84.5^\circ$ ; *p*-nitrobenzoate, m.  $128.4^\circ$ ; palmitate, m.  $52.5^\circ$ ; pyrotartrate, m.  $101.5^\circ$ ; saccharate, m.  $120^\circ$ ; salicylate, m.  $110^\circ$ ; stearate, m.  $64^\circ$ ; succinate, m.  $148^\circ$ ; tartrate, m.  $130^\circ$ . Formic, butyric, valeric and oleic acids gave oily products; no ester of  $(\text{CO}_2\text{H})_3$  could be prepd. from either the Na, K or  $\text{NH}_4$  salt; asparaginic and gallic acids yielded gums, and naphthionic acid gave no satisfactory result. Attempts to prep. phenylhydrazones from the benzoate, salicylate, valerate and butyrate (from the ester and  $\text{PhNHNH}_2$  in hot alc.) yielded products m.  $132-5^\circ$  which were apparently all Hess' tetraphenyltetra-carbazone (*Ann.* 232, 235(1886)) in varying degrees of purity, the esters evidently reacting with the  $\text{PhNHNH}_2$  with splitting off of the acid radical. The *oxime* of the benzoate seps. from petr. ether in needles, m.  $92^\circ$ ; the oximes of the formate, cinnamate and mandelate are oils. These oximes are very sol. in the usual org. solvents except petr. ether. C. A. ROUILLER.

**Synthesis of aminoflavones, of flavoneazo- $\beta$ -naphthol dyes and of other flavone derivatives.** MARSTON TAYLOR BOGERT and JOSEPH K. MARCUS. *J. Am. Chem. Soc.* 41, 83–107(1919).—When  $\text{PhC:CCO}_2\text{Et}$  (a) is added to a "warm" ( $60-70^\circ$ ) mixt. of  $\text{PhONa}$  and  $\text{PhOH}$  (Ruhemann, *Ber.* 24, 2582(1891)), the  $\text{PhONa}$  only partially dissolves and the product, which distils over a wide range ( $140-215^\circ$  under 12 mm.), smells of (a), but with (a),  $\text{PhONa}$  suspended in xylene and an excess of  $\text{PhOH}$  at  $140-50^\circ$ , the product, treated by R.'s method, gives 2 fractions: (b), 10 g.,  $b_{18} 203-16^\circ$ , and (c), 116.1 g.,  $b_{18} 216-9^\circ$ , m.  $37-45^\circ$ . On sapon. with alc. NaOH, (c) gives not 1, but 2 acids: (d), 8 g., sepg. first from alc. in broad prisms, and then (e), 49 g., needles. After repeated crystn. from alc. (e) softened  $126^\circ$  and m.  $139-40^\circ$  (gas evolution) and proved to be fairly pure  $\text{PhOCPh:CHCO}_2\text{H}$ . (d) after similar treatment softened  $169^\circ$ , m.  $176-7^\circ$ , gave tests for a phenol HO group with Liebermann's reagent and with  $\text{TiO}_2$  in  $\text{H}_2\text{SO}_4$  gave no color with aq. or alc.  $\text{FeCl}_3$  dissolved in concd.  $\text{H}_2\text{SO}_4$  with bright yellow color and decolorized Br in  $\text{CHCl}_3$ ; B. and M. believe it to be  $\beta$ -*o*- or *p*-hydroxyphenylcinnamic acid. Flavone (f) was obtained essentially by R.'s method from (e) in 85% yield. In its nitration all attempts to limit the action to the formation of only 1 mono- $\text{NO}_2$  deriv. failed; 60.5 g. (f) in 60 cc. AcOH and 180 cc.  $\text{H}_2\text{SO}_4$  treated with 32 cc. AcOH- $\text{HNO}_3$  (0.58 g.  $\text{HNO}_3$  (d. 1.5) per cc.), allowed to stand in the ice-box 3 days and poured into ice-water, gave 69 g. of faint yellow ppt. sepd. by crystn. from AcOH into 39 g., m.  $175-206^\circ$ , of a mixt. of the 3'- and 4'-nitroflavones (g),

and 19 g., m. 143-68°, of a mixt. of the 2'- and 3'-nitro compounds (h). These were not isolated individually but converted into the NH<sub>2</sub> derivs. which were sepd. by means of their different basicities and solubilities. 2'-Amino-*flavone*, obtained in 7 g. yield from 19 g. (h) by reduction with SnCl<sub>2</sub> and HCl in alc., silky, pale yellow needles from Me<sub>2</sub>CO, m. 149.5-150.5°, gives a positive isonitrile test, sol. without color in cold concd. H<sub>2</sub>SO<sub>4</sub>, in concd. HNO<sub>3</sub> with yellow color, reduces cold KMnO<sub>4</sub> in dil. H<sub>2</sub>SO<sub>4</sub>, gives a black amorphous ppt. with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in warm dil. H<sub>2</sub>SO<sub>4</sub>. 4'-Amino-*flavone*, from (g), long golden yellow needles from xylene, m. 234-6°, imparts to iso-AmOH, glycerol and EtOH an intense bluish green, to Et<sub>2</sub>O, Me<sub>2</sub>CO, AcOEt, AcOAm and C<sub>6</sub>H<sub>5</sub>N an intense blue, to MeOH and PhOH a faint green fluorescence, to CHCl<sub>3</sub>, C<sub>6</sub>H<sub>6</sub>, PhMe, xylene, ligroin, CCl<sub>4</sub> and AcOH no fluorescence; in Et<sub>2</sub>O free from H<sub>2</sub>O and alc. there is no trace of fluorescence but the addition of a drop of EtOH or H<sub>2</sub>O at once produces an intense blue fluorescence. In those solvents in which fluorescence does not occur (C<sub>6</sub>H<sub>6</sub>, etc.) a considerable amt. of a solvent containing a HO group must be added before the fluorescence is brought out (e. g., 0.5 cc. iso-AmOH to 5 cc. C<sub>6</sub>H<sub>6</sub>). In H<sub>2</sub>O, the absence of fluorescence is probably due to the insoly. of the amine; in AcOH, to the neutralization of the NH<sub>2</sub> group. The amine dissolves with yellow color in MeOH, EtOH, AcOEt, AcOH and without color in the other solvents; light yellow colors are obtained by impregnating wool and silk in HCl solns. of the HCl salt and developing the color in dil. Na<sub>2</sub>CO<sub>3</sub>. 3'-Amino-*flavone*, lemon-yellow needles from xylene, m. 156-7°, gives light yellow colors on wool and silk. 2'-Diacetyl-*amino-*flavone**, oblong prisms from alc., m. 186.5-7.5°, sol. without color in concd. H<sub>2</sub>SO<sub>4</sub>; 3'-isomer, hair-like needles from Me<sub>2</sub>CO, m. 231-2°; 4'-compound, hair-like needles from alc., m. 246-8°. 2'-Hydroxy-*flavone*, from the NH<sub>2</sub> deriv. through the diazonium compd., plates from alc., m. 249-50°, slowly sol. in cold concd. H<sub>2</sub>SO<sub>4</sub> with greenish yellow color and slight green fluorescence, sol. in cold dil. or hot concd. NaOH. 3'-Isomer, narrow plates, m. 207-8°. 4'-Compd., needles from alc., m. 269-70°. 2'-Acetoxy-*flavone*, long, thin needles from dil. alc., m. 88.5-9°; 3'-compd., long needles from dil. alc., m. 97-8°; 4'-compd., needles from dil. alc., m. 136°. With NaOEt the above HO compds. give *o*-HOC<sub>6</sub>H<sub>4</sub>Ac and *o*-, *m*- and *p*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, resp. *Flavone-2'-azo-β-naphthol*, from the 2'-amine and β-naphthol through the diazonium compd., hair-like orange-red needles from AcOH, m. 265-6.5° (decompn.), sol. in cold H<sub>2</sub>SO<sub>4</sub> with reddish purple color. 3'-Isomer, flat, crimson prisms from AcOH, m. 257° (decompn.), sol. in H<sub>2</sub>SO<sub>4</sub> with deep wine-red color. 4'-Compound, dark red needles from AcOH, m. 274-5° (decompn.), sol. in H<sub>2</sub>SO<sub>4</sub> with deep purple color. The 2'- and 3'-compds. gave bright orange colors on silk and duller orange shades on wool, while the 4'-compd. gave red colors; cotton, however, even when previously impregnated with turkey-red oil, took the dyes unevenly. The dyed materials are very fast to light and alkalis but are dulled by 2% AcOH. Methyl β-bromohydrocinnamate, from the acid, MeOH and HCl, thick prisms from petr. ether, m. 37.5-8.5°. β-Phenoxyhydrocinnamic acid (i), obtained in 10.4 g. yield from 30 g. PhCHBrCH<sub>2</sub>CO<sub>2</sub>H and 13 g. dry PhOH in 50 cc. C<sub>6</sub>H<sub>6</sub> kept 2 hrs. at 85-90°, long, silky needles from C<sub>6</sub>H<sub>6</sub>, m. 150-1°, sol. in dil. Na<sub>2</sub>CO<sub>3</sub>; the NH<sub>4</sub> salt gives ppts. with the nitrates of Cd, Cu<sup>+</sup>, Pb and Ag but not with salts of Na, K, Ca, Ba, Bi, Co or Fe<sup>++</sup>. From the C<sub>6</sub>H<sub>6</sub> filtrate from the above acid, by removing the PhOH with steam, dissolving the residual oil in Et<sub>2</sub>O and extg. with Na<sub>2</sub>CO<sub>3</sub>, were obtained PhCH:CHCO<sub>2</sub>H and 1.4 g. white needles from PhMe, m. 151.5-2.5°, which are believed to be *p*-HOC<sub>6</sub>H<sub>4</sub>CHPhCH<sub>2</sub>CO<sub>2</sub>H (Liebermann, *Ber.* 24, 2582), while the Et<sub>2</sub>O, after the extn. with Na<sub>2</sub>CO<sub>3</sub>, yielded 8.2 g. β-phenylhydrocoumarin, m. 81.5-2°, b<sub>40</sub> 243°. In attempting to convert (i) into flavanone by heating 6.7 g. of it with 60 g. concd. H<sub>2</sub>SO<sub>4</sub> 1 min. at 130-5°, it was found that the product was a disulfo-β-phenoxyhydrocinnamic acid, isolated as the barium salt [Ba(O<sub>2</sub>S)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>CH(OPh)CH<sub>2</sub>CO<sub>2</sub>]<sub>2</sub>

Ba.5.5H<sub>2</sub>O, thin, broad microplates from H<sub>2</sub>O and alc. (yield, 4 g.), gives ppts. with salts of Bi, Cr'', Co, Ag, Sn'', but not with those of Na, K, Ca, Ba, Al, Cd, Cu'', Fe'', Pb, Mg, Mn, Hg'', Ni or Zn. Attempts to effect the condensation of (i) to flavanone with other dehydrating agents or of its chloride with AlCl<sub>3</sub> likewise failed. 2-Nitroflavanone is obtained rapidly but in poor yield (2%) by heating 25 g. PhCHBrCH<sub>2</sub>CO<sub>2</sub>H and 15.5 g. *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH 30 min. in 30 cc. C<sub>6</sub>H<sub>6</sub> at 80–5°; it seps. from AcOH in long, silky needles, m. 144–4.5°, insol. in NaOH and Na<sub>2</sub>CO<sub>3</sub>, does not reduce alk. KMnO<sub>4</sub> in the cold and reduces it only slowly on boiling. All m. ps. given above are cor.

CHAS. A. ROUILLER.

**Influence of catalysts on the chlorination of hydrocarbons.** V. R. KOKATNUR. *J. Am. Chem. Soc.* 41, 120–4 (1919).—A number of expts., in which (CHCl<sub>3</sub>)<sub>2</sub> containing various catalysts (vegetable charcoal, animal charcoal, Fe, bleaching powder, AlCl<sub>3</sub>) was treated with Cl, are described briefly. C<sub>2</sub>Cl<sub>4</sub> was obtained in every case, but C<sub>2</sub>HCl<sub>3</sub> in none.

CHAS. A. ROUILLER.

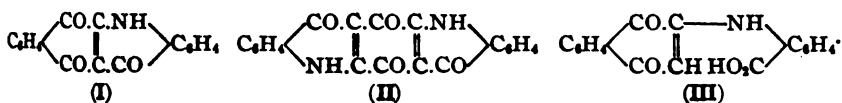
**Action of chlorine upon hydrazine, hydroxylamine and urea.** C. T. DOWELL. *J. Am. Chem. Soc.* 41, 124–5 (1919).—In the course of a study of the action of Cl on urea, D. obtained evidence that in the reaction of Cl with NH<sub>2</sub>OH and N<sub>2</sub>H<sub>4</sub> NCl<sub>3</sub> is formed; if the reaction is allowed to take place in the presence of CCl<sub>4</sub> and the CCl<sub>4</sub> layer is afterwards treated with KI N is evolved. Chattaway (*Chem. News* 98, 285 (1902)), who isolated dichlorourea from the reaction product of Cl and urea, observed that solns. of this compd. on standing decomp., giving NCl<sub>3</sub> as one of the products; he supposed that the reaction took place between dichlorourea and H<sub>2</sub>O, with formation of CO<sub>2</sub> and NH<sub>4</sub>Cl and that the latter decompd. into NH<sub>3</sub> and NCl<sub>3</sub>. D. has tested the soln. for NH<sub>2</sub>Cl by Raschig's method (NH<sub>3</sub> + BzH) with negative results, and concludes that the NCl<sub>3</sub> is formed by the action of Cl which is itself probably a decompn. product of the dichlorourea.

CHAS. A. ROUILLER.

**The linear phenonaphthacridonequinone and quinacridonequinone.** W. ST. LENSIAŃSKI. Techn. Hochschule, Lemberg. *Ber.* 51, 695–706 (1918).—The 2 compds. were prepd. to det. whether acridone-like quinones are vat dyes. Phenonaphthacridonequinone (I), reduced with alk. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, yields a blue vat dye giving orange-yellow shades on cotton, but the yellow-orange quinacridonequinone (II) does not normally give a vat dye, for the dark green alkali salt of its leuco deriv. is almost insol. in H<sub>2</sub>O. The blue-violet NH<sub>2</sub> derivs. of these 2 substances show markedly the characteristics of vat dyes. The 2 quinones have pronounced salt-forming properties, surpassing, in this respect, the ordinary acridones. Anilino- $\alpha$ -naphthoquinone-*o*-carboxylic acid (III), obtained in 95% yield by gently boiling for some time equal amts. of  $\alpha$ -naphthoquinone and *o*-H<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H in alc., red needles from AcOH or alc., m. 271°, sol. in alc. and AcOH with red, in Et<sub>2</sub>O, AcOEt and C<sub>6</sub>H<sub>6</sub> with orange-yellow, in concd. H<sub>2</sub>SO<sub>4</sub> with cherry-red color, pptd. unchanged from the last solvent by H<sub>2</sub>O. The deep red alk. soln., when boiled for a time and then treated with an excess of HCl, gives 2-hydroxy-1,4-naphthoquinone. Silver salt, from the K salt and AgNO<sub>3</sub> in H<sub>2</sub>O, amorphous, dark red ppt. When warmed a short time at 140–50° in about 10 parts concd. H<sub>2</sub>SO<sub>4</sub> and then poured upon ice, (III) gives 70–5% of (I), purified by conversion into the K salt, decompn. with HCl and crystn. from AcOH; (I) forms a yellow-orange powder subliming in orange needles, m. 384°, forms non-fluorescent solns. Potassium salt, red micro-needles with 1 H<sub>2</sub>O from the orange solns. of (I) in dil. KOH. If a slightly warmed soln. of (I) in HNO<sub>3</sub> (d. 1.4) is cautiously dild. with H<sub>2</sub>O the nitrate (I).2HNO<sub>3</sub>, seps. in light yellow needles slowly losing their HNO<sub>3</sub> and becoming orange. A yellow cryst. sulfate and yellow needles of a hydrochloride can be obtained in the same way. CrO<sub>3</sub> ppts. dirty yellow flocks from the AcOH soln. of (I). (I) gives no bisulfite compd., is not reduced by SO<sub>2</sub>, does not react with PhNHNH<sub>2</sub> and forms no azine with *o*-C<sub>6</sub>H<sub>4</sub>-

( $\text{NH}_3$ ). On distn. with Zn dust it yields linear dihydrophenonaphthacridine, m.  $285-6^\circ$  (Schöpf, *Ber.* 27, 2841 (1894)). *Dihydrophenonaphthacridonequinone*, from (I) and  $\text{Na}_2\text{S}_2\text{O}_4$  in boiling alc., red-violet powder, m.  $317^\circ$ , quickly changes back into (I) in the air, forms in alkalis blue solns. which in the air deposit the red salt of (I); boiled 3 hrs. with  $\text{Ac}_2\text{O}$  and  $\text{NaOAc}$ , it yields an *acetyl derivative*, orange needles from  $\text{AcOH}$ , m.  $292^\circ$ , insol. in cold alkalis but easily sapond. on heating. *Dinitrophenonaphthacridonequinone*, obtained in 2 g. yield by cautiously warming 2.6 g. (I) in 25 cc.  $\text{H}_2\text{SO}_4$  for 1 hr. with 2 cc. fuming  $\text{HNO}_3$  (d. 1.52) and 5 cc.  $\text{H}_2\text{SO}_4$ , yellow microcryst. powder from  $\text{PhNO}_2$ , m.  $299^\circ$ , sol. in alkalis with red color; with little alk.  $\text{Na}_2\text{S}_2\text{O}_4$  it first gives a violet color (probably owing to the formation of the di- $\text{NH}_2$  deriv.) and with more  $\text{Na}_2\text{S}_2\text{O}_4$  dissolves with blue-green color, the soln. depositing in the air a red-violet ppt. of the presumed di- $\text{NH}_2$  compd. Crude (II) is obtained in 80% yield as a brown, compact mass by heating benzoquinonedianthranilic acid (a) with 15-7 parts concd.  $\text{H}_2\text{SO}_4$  20 min. at  $145-55^\circ$ ; owing to its insoly. in org. solvents it can be purified only by rubbing 10 g. to a paste with a little alc., dilg. with  $\text{H}_2\text{O}$  to 1 l., pouring 100 cc. of the resulting suspension into 1.5-1.0 boiling  $\text{H}_2\text{O}$ , treating, with continuous stirring, with 10-2 g.  $\text{KOH}$  in 100 cc.  $\text{H}_2\text{O}$  and filtering hot; on cooling the *potassium salt* seps. in red microneedles from which the free (II) is obtained by decompn. with dil.  $\text{AcOH}$ . It can also be purified through the cryst. sulfate; 5 g. (a) in 50 cc. concd.  $\text{H}_2\text{SO}_4$  are heated to  $150^\circ$  and poured into 550 cc. cold dil.  $\text{H}_2\text{SO}_4$  (d. 1.53); the sulfate seps. in 2.5 g. yield and by repeated boiling with  $\text{H}_2\text{O}$  is converted into the free (II) (about 1 g.). (II) is an amorphous, yellow powder, sublimes partly in dark orange needles, carbonizes above  $530^\circ$  without melting, sol. with orange color in hot alkalis of suitable concn., almost insol. in concd. alkalis and in alc.  $\text{KOH}$ , sol. in concd.  $\text{H}_2\text{SO}_4$  and in fuming  $\text{HNO}_3$  with orange color, insol. in concd.  $\text{HCl}$ . The *monopotassium salt*, red needles with 1  $\text{H}_2\text{O}$ , cannot be obtained absolutely pure as an excess of alkali is required to dissolve the (II) and some of the *dipotassium salt* seps. along with the former; the latter seps. in amorphous, brown-yellow flocks with 1  $\text{H}_2\text{O}$ . Both salts are extremely easily hydrolyzed by traces of  $\text{H}_2\text{O}$  and even of alc. *Nitrate*, (II). $4\text{HNO}_3$ , from 1 g. (II) in 25 cc. fuming  $\text{HNO}_3$  (d. 1.52) treated with 20 cc. dil.  $\text{HNO}_3$  (d. 1.333) and allowed to cool, golden yellow needles, quickly loses about 0.5 of its  $\text{HNO}_3$  in the air, turning red. *Sulfate*, (II). $3\text{H}_2\text{SO}_4$ , leaflets, becomes red when moistened with  $\text{H}_2\text{O}$  and changes to a yellow powder on boiling. (II) is unchanged by 18 hrs. heating at  $180^\circ$  in a sealed tube with 1:1  $\text{HCl}$ , is attacked by alkalis only on fusion; boiling  $\text{Ac}_2\text{O}$  yields only a very minute amt. of a dark red sol. product sol. in alc. with red color and eosin-like fluorescence;  $\text{AcCl}$ ,  $\text{BzCl}$  and  $\text{Me}_2\text{SO}_4$  give no sol. products;  $\text{NH}_4\text{OH.HCl}$  (in alc. at  $180^\circ$ ) and  $\text{PhNHNH}_2$  do not react with it. The alc. suspension treated with cold aq.  $\text{Na}_2\text{S}_2\text{O}_4$  gives the *leuco compound* as a blue-violet mass, very difficultly sol. in  $\text{Ac}_2\text{O}$  with violet, sol. in concd.  $\text{H}_2\text{SO}_4$  with blue color;  $\text{H}_2\text{O}$  ppts. it from the latter apparently unchanged in violet flocks; in the air these solns. turn through green into yellow-orange; the solid, especially if moist, undergoes the same oxidation back to (II); dil. alkalis dissolve it with light green color, the solns. quickly depositing the salt of (II) in the air. With alk.  $\text{Na}_2\text{S}_2\text{O}_4$  (II) gives a dark green flocculent ppt. and a faintly green soln. *Dinitroquinacridonequinone*, from 1.5 g. (II) in 30 cc. fuming  $\text{HNO}_3$  boiled gently 1.5 hrs., pptd. with  $\text{H}_2\text{O}$ , washed, dried and again heated 1.5-2.0 hrs. with fuming  $\text{HNO}_3$ , light yellow, insol., infusible powder, forms red stable alkali salts, gives no compds. with acids; with alk.  $\text{Na}_2\text{S}_2\text{O}_4$  it turns through violet into green-blue, yielding a liquid and a ppt. of the same color; in the air the soln. deposits the violet, presumably di- $\text{NH}_2$  deriv. *Potassium salt*, dark red powder with 2  $\text{H}_2\text{O}$ . *Dihydroquinacridine*, obtained in 0.6 g. yield by distg. about 80 g. (II) in 2-2.5 g. portions each with 25-30 g. Zn dust heated to redness in H under 200-300 mm., dark red

microcryst. powder with metallic luster from  $C_6H_6$ , m.  $379^\circ$ , sol. in hot alc. with red-dish yellow color and strong greenish yellow fluorescence, in AcOH with violet, in concd.  $H_2SO_4$  with violet-blue color, unattacked by concd.  $HNO_3$ ,  $CrO_3$ , etc.; HCl ppts. the blue-violet hydrochloride from alc. The  $C_6H_6$  mother liquors from the dihydro compd. yield a very small amt. of a brown-olive basic substance, m. above  $450^\circ$ , converted by acids into intensely green salts. All m. ps. given above are cor.



CHAS. A. ROUITLER.

**Influence of foreign substance on the activity of catalyzers. IV. Experiments with palladium hydrosol in the presence of mercury and mercuric oxide.** C. PAAL AND WILHELM HARTMANN. Univs. Erlangen and Leipzig. *Ber.* 51, 711-37(1918); *d. C. A.* 8, 1902.—Hg and HgO, the latter more rapidly, permanently destroy the catalytic power of colloidal Pd towards detonating gas and in catalytic hydrogenations; this paralysis of the catalyzer is brought about by Hg and HgO in the colloidal state much more rapidly than in the metallic or pptd. form, and it has been found that without exception the Pd hydrosol colloiddally dissolves the Hg by peptization, the HgO by chem. action, and it is only in this form that the Hg and HgO develop their specific action as strong contact poisons. The Pd hydrosols used in the expts. had been previously employed in gas burets with Hg as the confining liquid for catalyzing detonating gas or reducing org.  $NO_2$  and unsatd. compds. or had undergone a preliminary treatment with H or O or these 2 gases alternately in the presence of Hg, and on testing these Pd preps. with detonating gas or easily reducible  $NO_2$  and unsatd. compds. it was found that they had become passive in both types of reaction; this passivity, however, is specific and limited to these 2 reactions; towards  $H_2O_2$  the Pd sols. rendered inactive by Hg and HgO are strongly catalytic. The soln. of metallic Hg by the Pd hydrosol takes place only slowly and the decrease in catalytic activity of the Pd progresses parallel with the soln. of the Hg until, when a certain amt. (varying with different sols) has been taken up the Pd is completely paralyzed; the amts. of Hg necessary for this are directly proportional to the strength of the catalytic effect of the Pd sol. As the Hg is taken up not only in the presence of O but also in a H atm. on long contact with the Pd sol (this process is hastened by shaking) it can be present only in elementary form and, as has been found, in an acid-insol. and non-diffusible, i. e., colloidal form. That the process cannot be a purely mechanical "peptization" favored by the colloidal mixt. of Pd sol and Na protalbinat present is shown by the fact that solns. of Na protalbinat shaken a long time with metallic Hg do not take up the slightest trace of the metal. HgO is dissolved much more rapidly and in greater amt. and also in a non-diffusible form. If the process takes place in H there is a partial reduction of the HgO, for when a Pd sol rendered inactive in this way is treated with dil. HCl it gives a ppt. of colloidal Pd and free protalbinic acid containing elementary Hg in the same form as by direct treatment of metallic Hg with Pd hydrosol. The greater part of the Hg dissolved from the pptd. HgO by the Pd sol, however, is found in the HCl filtrate as  $HgCl_2$  and must therefore have been present in the Pd sol in an acid-sol. form. Since, as found experimentally, pptd. HgO, contrary to metallic Hg, is dissolved colloiddally by shaking with an aq. soln. of Na protalbinat, there occurs here apparently not only a peptization as the result of mechanical action but also a chemical process resulting in a colloidal salt-like combination, decompd. by HCl, of the HgO with the Na protalbinat. That the anti-catalytic action of the HgO is not due exclusively to the elementary Hg produced by

its reduction and dissolved by the Pd is shown by the fact that a Pd hydrosol completely paralyzed by shaking with pptd. HgO in a H atm. and then freed of the sol. portion of the Hg by pptn. with HCl recovers a part of its original activity. P. and H. conclude that the anticatalytic effect of Hg and HgO are due to their destruction of the power of Pd hydrosol to adsorb H and that therefore they inhibit all those catalytic processes effected by adsorption of H, like the catalysis of detonating gas and catalytic hydrogenations and dehydrogenations, but not the catalytic decompn. of  $H_2O_2$ . CHAS. A. ROUILLER.

**Bromoalkylated aromatic amines. III. Derivatives of ethylenediamine.** J. v. BRAUN AND E. MÜLLER. Univ. Techn. Hochschule, Warschau. *Ber.* 51, 737-41 (1918); cf. C. A. 12, 2557.— $\omega$ -Bromoethyl derivs.,  $PhNRCH_2CH_2Br$ , of sec. aromatic bases condense with sec. amines easily to form ethylenediamine derivs. of the type  $PhNRCH_2CH_2NR'R''$  in which  $R'$  and  $R''$  may be aromatic or aliphatic groups. By nitrosating the Ph nuclei and hydrolyzing the NO compds., it is possible to obtain purely aliphatic ethylenediamine derivs. of the types  $RNHCH_2CH_2NHR'$  and  $RNHCH_2CH_2NR'R''$  with the same or different alkyl groups on the 2 N atoms. *Dinitroso-N,N'-diphenyl-N,N'-dimethylethylenediamine monohydrochloride*, obtained quant. by nitrosating the diamine, fine green-brown powder, m.  $153^\circ$ ; free base, bright green, m.  $108^\circ$ . Boiled 0.5 hr. with 40 parts  $NaHSO_3$  soln. (d. 1.21), acidified with HCl, concd. to 0.5 its vol., made strongly alk. and distd. with steam, the distillate being collected in dil. HCl, the NO compd. gives 80-8%  $(CH_3NHMe.HCl)_2$ , m.  $235-6^\circ$ ; free base, m.  $120^\circ$ . *N-Methyl-N'-ethyl-N,N'-diphenylethylenediamine*, obtained almost quant. by warming 10 hrs. on the  $H_2O$  bath  $PhNMeCH_2CH_2Br$  and about 3 mols.  $PhNHEt$  or  $PhNEtCH_2CH_2Br$  and the corresponding amt. of  $PhNHMe$ , almost colorless and odorless, thick liquid,  $b_{21}$   $232-4^\circ$ ; *picrate*, fine crystals from alc., m.  $176^\circ$ ; *p,p'-dibromo derivative*, obtained by bromination in AcOH, needles from alc., m.  $100^\circ$ . The *dinitroso compound*, fine yellow-green powder, m.  $190^\circ$ , gives with  $NaHSO_3$  *N-methyl-N'-ethylethylenediamine*, isolated as the *dihydrochloride*, very hygroscopic, m.  $217-8^\circ$ ; *chloroplatinate*, m.  $240^\circ$ ; the free base is a mobile liquid of the same odor as the di-Me compd., b.  $133^\circ$ , fumes in the air with absorption of  $CO_2$  and moisture. Nitrosation of  $PhNMeCH_2CH_2NMe_2$  (C. A. 12, 1391), even in the presence of excess of HCl and on long standing, does not result in the sepn. of a difficultly sol. HCl salt; by making the soln. alk. with soda the crude free base itself is obtained as a dark oil which is extd. with  $Et_2O$  and, after removal of the  $Et_2O$ , is hydrolyzed to  $MeNHCH_2CH_2NMe_2$  (a). The (a).2HCl obtained in this way and described in the first paper was not pure; it has now been obtained pure by treating it with very concd. NaOH, extg. 3 times with  $Et_2O$ , drying a short time, treating with excess of picric acid, boiling the picrate with not too much abs. alc. and filtering hot; the yellow, finely cryst. portion remaining undissolved proves to be the pure *picrate*,  $C_{17}H_{20}O_4N_8$ , m.  $209-10^\circ$ ; this, treated with alkali, extd. with  $Et_2O$  and pptd. with HCl and  $Et_2O$ , gives the pure *dihydrochloride*, m.  $183^\circ$ ; *chloroplatinate*, long, pointed, yellow-red needles from a little  $H_2O$ , darkens  $225^\circ$ , m.  $230^\circ$  (decompn.); the free base b. about  $140^\circ$ . CHAS. A. ROUILLER.

**Attempt to synthesize fisetol. Preliminary communication.** J. TAMBOR AND EDMOND M. DuBOIS. Univ. Bern. *Ber.* 51, 748-51 (1918).— $\omega$ -Bromoresacetophenone methyl ether (a), 2,4-HO(MeO) $C_6H_3$ COCH $_2$ Br, prisms from alc., m.  $92^\circ$ , difficultly volatile with steam, is obtained by slowly treating in the cold 40 g.  $AlBr_3$  in 40 g.  $BrCH_2COBr$  with 50 g.  $m-C_6H_4(OMe)_2$  in 100 g.  $CS_2$ , letting stand 3 days at room temp., protected from moisture, decanting the solvent from the resinous product, washing several times with  $CS_2$ , decompg. with ice, removing the unchanged  $C_6H_4(OMe)_2$  with steam and placing the oily residue in a freezing mixt. In the same way is obtained  $\omega$ -chlororesacetophenone dimethyl ether, needles from  $C_6H_6$ , m.  $119^\circ$ . (a) boiled a long



time with concd. aq. KI gives the *ω*-iodo compound, very faintly, yellow, prisms from dil. alc., m. 102°. With  $\text{Ac}_2\text{O}$  and  $\text{H}_2\text{SO}_4$  (a) gives the acetate  $\text{AcO}(\text{MeO})\text{C}_6\text{H}_4\text{COCH}_2\text{Br}$ , needles from alc., m. 83°, probably identical with Friedländer's brominated acetylpeanol, m. 86–7° (*Ber.* 30, 301 (1897)), whereas acetylation of (a) in small amts. with  $\text{Ac}_2\text{O}$ - $\text{NaOAc}$  gives 4-methylfisetyl diacetate, 2,4- $\text{AcO}(\text{MeO})\text{C}_6\text{H}_2\text{COCH}_2\text{OAc}$ , scales from alc., m. 86°, which on short warming with alc. KOH yields fisetyl 4-methyl ether, scales from alc., m. 128°. This, if a method of dealkylation can be discovered, should give fisetol.

C. A. ROULLER.

**$\beta$ -Naphthylsulfur chlorides.** TH. ZINCKE AND K. EISMAYER. Marburg. *Ber.* 51, 751–67 (1918).— $\beta\text{-C}_{10}\text{H}_7\text{SH}$  (a),  $b_p$  153–4°, is obtained in 75–80% yield by treating 80 g. crude  $\beta\text{-C}_{10}\text{H}_7\text{SO}_3\text{Cl}$  in 400 cc. alc. and 2 cc. concd. HCl with 70 g. Zn dust in small portions, below 40°, stirring 30–45 min. longer, warming gradually, again adding 70 g. Zn dust, then 100 cc. concd. HCl with continuous shaking, heating on the  $\text{H}_2\text{O}$  bath under a reflux until a portion pptd. with  $\text{H}_2\text{O}$  dissolves clear in alkali (more Zn dust and acid being added if necessary but too long boiling being avoided), pouring hot into 1.5 l.  $\text{H}_2\text{O}$  acidified with HCl, boiling the residue up twice with alc. HCl, filtering, dissolving in  $\text{Et}_2\text{O}$  and drying with  $\text{Na}_2\text{SO}_4$ . Treated with Cl in 10 parts, glacial AcOH it gives a ppt. of the disulfide which redissolves and on further treatment with Cl is converted into  $\text{C}_{10}\text{H}_7\text{SO}_3\text{Cl}$ , but if 5 g. in 30 cc. dry  $\text{CHCl}_3$ , protected from moisture, is treated with 1 mol. Cl, allowed to stand some time, evapd. *in vacuo* and dried on clay over  $\text{H}_2\text{SO}_4$  there is obtained  $\beta$ -naphthylsulfur chloride,  $\text{C}_{10}\text{H}_7\text{SCl}$ , yellow-red cryst. powder, m. 50–60°, quickly becomes colorless on standing, with loss of Cl and HCl and formation of the disulfide chiefly with small amts. of a faintly green product; with alkalis, alc.,  $\text{Me}_3\text{CO}$ ,  $\text{PhNH}_2$ ,  $\beta$ -naphthol, it gives the disulfide. 1-Chloronaphthyl-2-sulfur chloride (b), obtained in 6 g. yield from 5 g. (a) in 40 cc. dry  $\text{CHCl}_3$  treated with the Cl evolved with 4 g.  $\text{KMnO}_4$ , yellow-red crystals from hexane, m. 74–5°, stable and very reactive; treated in 8–10 parts AcOH with Cl to disappearance of the yellow-red color it gives 1,2- $\text{C}_{10}\text{H}_6\text{ClSO}_2\text{Cl}$ , thick needles from benzene, m. 84–5°; with dry NaOMe in hexane it forms the ester  $\text{ClC}_{10}\text{H}_6\text{S.OMe}$ , unstable, almost colorless oil, decomp. in a few hrs. in the air into the disulfide and disulfoxide and is converted back into (b) by concd. HCl; 10 g. in 150–60 cc. benzene shaken 20–30 min. with 200 cc. of *N* soda gives di-1-chloronaphthyl-2-sulfur oxide,  $(\text{ClC}_{10}\text{H}_6\text{S})_2\text{O}$ , bright yellow crystals from PhMe, m. 149° (blackening), converted back into (b) by  $\text{PCl}_5$ , decompd. by hot alkalis into the disulfide and the sulfinic acid and by boiling AcOH into the disulfide and the disulfoxide. Di-1-chloronaphthyl-2-disulfide, slender leaflets from AcOH, m. 141–2°, sol. in concd.  $\text{H}_2\text{SO}_4$  without color. 1-Chloronaphthyl-2-sulfinic acid, felted needles from AcOH, m. 138–9° (blackening): methyl ester, prepd. through the Ag salt, long needles from MeOH, m. 139–40°, identical with the sulfone prepd. from 1,2- $\text{C}_{10}\text{H}_6\text{ClSMe}$ . Di-1-chloronaphthyl 2-disulfoxide, also obtained from (b) and the Ag salt of the  $\text{SO}_3\text{H}$  acid in boiling  $\text{C}_6\text{H}_6$ , prismatic needles from  $\text{C}_6\text{H}_6$ -benzene, m. 152–3°, liberates I from KI in AcOH, decompd. by boiling alkalis into the disulfide and  $\text{SO}_3\text{H}$  acid. 1-Chloronaphthyl-2-sulfuramine,  $\text{ClC}_{10}\text{H}_6\text{SNH}_2$ , obtained by adding 5 g. (b) in 50–60 cc.  $\text{Et}_2\text{O}$  to 50 cc. of 25%  $\text{NH}_4\text{OH}$  (covered with a layer of  $\text{Et}_2\text{O}$ ), washing the  $\text{Et}_2\text{O}$  layer with  $\text{H}_2\text{O}$ , evapg. *in vacuo*, dissolving in cold MeOH and pptg. with  $\text{H}_2\text{O}$ , short, thick needles from benzene, easily becoming reddish, reddens 95°, begins to decomp. 105–10°, m. about 160°, decompd. by cold concd. HCl into (b), converted by dil. HCl or glacial AcOH into the imine, gives with 1 part  $\text{BzH}$  and 15 parts MeOH after 24 hrs. the compound  $\text{ClC}_{10}\text{H}_6\text{SN:CHPh}$ , pptd. by  $\text{H}_2\text{O}$  from alc. in needles, m. 106–7°. Di-1-chloronaphthyl-2-sulfurimine,  $(\text{ClC}_{10}\text{H}_6\text{S})_2\text{NH}$ , also obtained by passing an excess of dry  $\text{NH}_3$  into a 1:10 soln. of (b) in  $\text{Et}_2\text{O}$  and purified by heating to boiling with 4 parts  $(\text{CHCl}_3)_3$ , adding 2 vols.  $\text{C}_6\text{H}_6$ , filtering hot

and washing with hot  $C_6H_6$ , faintly colored cryst. powder, m.  $213-4^\circ$ , stable towards cold, concd. HCl but decompd. on heating into the disulfide and disulfoxide, sol. in concd.  $H_2SO_4$  (decompn.) with blue-black color. *1-Chloronaphthyl-2-sulfurethylamine*, from 2 g. (b) in 20 cc.  $Et_2O$  added to 3 cc. of 30% aq.  $MeNH_2$ , leaflets from  $MeOH-H_2O$ , m.  $89-90^\circ$ , decompd. by concd. HCl into (b), converted by dil. HCl, better by glacial AcOH, into the *methylimine*,  $(ClC_{10}H_6S)_2NMe$ , also obtained by adding 3 cc. of 30%  $MeNH_2$  to 2 g. (b) in 40 cc.  $Et_2O$ , leaflets from  $C_6H_6$ -benzine, m.  $177-8^\circ$ , stable towards cold concd. HCl, profoundly decompd. on heating, slowly decompd. by boiling AcOH, chiefly into the disulfide. *1-Chloronaphthyl-2-sulfuranilide*, from (b) in  $C_6H_6$  warmed with somewhat more than 2 mols.  $PhNH_2$ , prismatic needles from benzine, m.  $132^\circ$ , decompd. by concd. HCl chiefly into the disulfide and disulfoxide.  *$\alpha$ -Naphthalide*, crystals from  $C_6H_6$ -benzine, m.  $154^\circ$ , gives a red dye with  $PhN_2Cl$ . *2,4-Di-[1'-chloronaphthyl-2'-sulfur]- $\alpha$ -naphthylamine*,  $(ClC_{10}H_6S)_2C_{10}H_6NH_2$ , from (b) in 10 parts hot AcOH treated with 0.5 part  $\alpha$ - $C_{10}H_7NH_2$  in 6 parts AcOH, crystals from  $EtOH-H_2O$ , m.  $85-7^\circ$ , can be diazotized in AcOH and yields a red dye with  $\beta$ -naphthol; *acetyl derivative*, prepd. with  $Ac_2O-NaOAc$ , needles from AcOH, m.  $144-5^\circ$ . *1-Chloronaphthyl-2-sulfur- $\beta$ -naphthalide*, needles, m.  $132-3^\circ$ , decompd. by concd. HCl; 1 g. boiled a short time with 10 cc. AcOH and 1 cc. AcOH satd. with HCl is converted into the isomeric  *$\alpha$ -1-chloronaphthyl-2-sulfur- $\beta$ -naphthylamine*, also obtained directly by warming (b) with 20 parts AcOH and 0.65 part  $\beta$ - $C_{10}H_7NH_2$ , prisms and needles from  $C_6H_6$ -benzine, m.  $183-4^\circ$ , can be diazotized in AcOH and gives with  $\beta$ -naphthol a red dye; *diacetyl derivative*, needles from AcOH, m.  $153-4^\circ$ . The amine boiled a short time with 0.5 mol. (b) in  $C_6H_6$  (20 parts for every part (b)), gives the compound  $1,2-C_{10}H_6(SC_{10}H_6Cl)NHSC_{10}H_6Cl$ , slender needles from  $C_6H_6$ -benzine, m.  $187-8^\circ$ , which on warming with AcOH-HCl easily loses the  $SC_{10}H_6Cl$  group attached to the N. *1-Chloronaphthyl p-dimethylaminophenyl 2-sulfide*, from (b) in 5 parts  $C_6H_6$  warmed a short time with 2 mols.  $PhNMe_2$ , prisms and needles from benzine, m.  $120-1^\circ$ , has faintly basic properties.  *$\alpha'$ -[1-Chloronaphthyl-2-sulfur]- $\alpha$ -naphthol*,  $1,4-C_{10}H_6(OH)SC_{10}H_6Cl$ , from (b) in 12 parts  $C_6H_6$  boiled with 1 mol.  $\alpha$ -naphthol to disappearance of the red color, needles from  $MeOH-H_2O$ , m.  $116-8^\circ$ , sol. in warm N alkali, partially sepg. again on cooling or dilg., converted by oxidizing agents (Br and alkalis) into a blue-green substance; *acetyl derivative*, crystals from benzine, m.  $138-9^\circ$ .  *$\beta$ -Naphthol isomer*,  $2,1-C_{10}H_6(OH)SC_{10}H_6Cl$ , from (b) and  $\beta$ -naphthol intimately mixed 10-5 min. on the  $H_2O$  bath, needles from  $C_6H_6$ -benzine, m.  $142-3^\circ$ , unchanged by hot  $PhNH_2$  or quinoline, gives no naphthoxine with HCl, sol. in alkalis, repptd. by diln.; *acetyl derivative*, needles from benzine, m.  $123-4^\circ$ . *[1'-Chloronaphthyl-2'-sulfur]-4-resorcinol*,  $1,3,4-C_6H_3(OH)_3SC_{10}H_6Cl$ , from 4 g. (b) and 2 g.  $m-C_6H_4(OH)_2$  boiled 3-4 hrs., in 50 cc.  $C_6H_6$ , leaflets from  $C_6H_6$ -benzine, m.  $153-4^\circ$ , sol. in dil. alkalis; *diacetate*, needles from benzine, m.  $83-4^\circ$ . *[1-Chloronaphthyl-2-sulfur]acetone*,  $ClC_{10}H_6SCH_2Ac$ , from (b) heated with  $Me_2CO$  until the color has almost disappeared, needles from  $C_6H_6$ -benzine, m.  $70-1^\circ$ ; *phenylhydrazone*, leaflets, m.  $202^\circ$ . *1-Chloronaphthyl 2-thiocyanate*, from (b) and 0.5 part KCN in 15 parts hot AcOH, crystals from benzine, m.  $118-9^\circ$ .

CHAS. A. ROUILLER.

**Manufacture of methyldichloroarsine.** R. H. UHLINGER AND R. V. COOK. *J. Ind. Eng. Chem.* 11, 105-9(1919).—A detailed description with diagrams is given for the production in 70-lb. lots of  $MeAsCl_2$ , a substance which promised to be of value for gas warfare purposes. The method of prepn. may be divided into three steps: (1) Treatment of aq.  $Na_2AsO_3$  with  $Me_2SO_4$  to give  $NaMeSO_4$  and  $Na_2MeAsO_3$ ; (2) reduction of  $Na_2MeAsO_3$  to  $MeAsO$  with  $SO_2$ ; (3) conversion of  $MeAsO$  into  $MeAsCl_2$  with aq. HCl.

ROGER ADAMS.

The production of synthetic alcohol. ANDRE DUBOSC. *Caoutchouc et gutta-*

*percha* 15, 9542-3(1918).—A review of the manuf. of EtOH from  $C_2H_2$  and  $CaC_2$ . D. states that these methods were first worked out by Berthelot about 50 yrs. ago.

JOHN B. TUTTLE.

The bitter principles of hops (WÖLLMER) 16. Miscibility of phenol and aqueous solutions of alkalies (DUBRISAY, *et al.*) 2.

**Phenanthraquinone.** H. F. LEWIS and H. D. GIBBS. U. S. 1,288,431, Dec. 17. Phenanthraquinone is formed by oxidation of vapors of phenanthrene with air at temps. of 300-500° (preferably about 400°) in the presence of a catalyst which may be  $V_2O_5$  or some other oxide of a metal of the fifth or sixth periodic group.

**Anthraquinone.** CHEMISCHE FABRIK GRIESHEIM-ELEKTRON. Swed. 44,184, June 26, 1918. In the treatment of anthracene with  $HNO_3$  below 60° and subsequently at a higher temp., in the presence of a solvent or diluent and Hg salts, Cl is introduced to decompose organic Hg compds.

**Citric acid.** H. TOBLER. U. S. 1,288,293, Dec. 17. Impure Ca citrate is treated with  $NaHSO_4$  to form Na citrate and  $CaSO_4$ . The  $CaSO_4$  is sepd. from the soln. and the latter is then heated with sufficient lime to neutralize free acidity and with sufficient  $CaSO_4$  to complete the reaction and ppt. Ca citrate. The latter is then sepd. from the soln., which retains the impurities, and decomposed to obtain pure citric acid.

**Alcohol.** ELEKTIZITÄTSWERK LONZA. Brit. 120,163, Mar. 16, 1918. In the manuf. of alc. by treating acetaldehyde vapor with H in the presence of a catalyst, the H is employed in large excess over the theoretical quantity; this gives a product containing little aldehyde or undesirable by-products and also serves to take up the heat developed in the reaction. The excess of H, after removal of the alc., is returned to the reaction vessel. Cf. C. A. 12, 2326.

## II. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

A note on the relation between proteolysins and hemolysins. A. MCNEIL AND R. L. KAHN. New York Univ. *J. Immunology* 3, 295-301(1918).—No evidence of proteolysis was obtained in the blood of rabbits following protein injections when a procedure simulating the production of hemolytic substances was followed.

GEO. T. CALDWELL.

**Chemistry and medicine—a tribute to the memory of John Harper Long.** JULIUS STIEGLITZ. *Science* 49, 31-8(1919).

E. H.

**Fate of starch grains injected into the circulation.** K. OKASAKI. *Chugai Iji Shimpo* No. 900, 1134-5(1917); *Jap. Med. Literature* 3, 72-3(1918); cf. C. A. 12, 374.—Taro starch, suspended in saline, was injected into the ear vein of rabbits, which were then killed after various intervals of time had elapsed. Their organs were examd. for starch emboli, and for diastatic change in the starch. Practically all the starch was caught in the lung, by lodgment in the capillaries or by the phagocytes, occasionally by newly formed giant cells. Evidence of diastatic action was found on all the grains only after 36 days. A similar series of exts. was made, in which the starch suspension was injected into the portal vein, and examn. made of the liver. Starch lodged in the Kupffer cells underwent change in a few days; that lodged in the periphery of the lobules changed

more slowly. The phagocytic cells exerted a diastatic action on the starch particles within their influence.

JOSEPH S. HEFURN.

**Enzyme studies. I. Ptyalin.** W. BIEDERMANN. *Fermentforschung* 1917, No. 1, 385-436; *Z. angew. Chem.* 1917, No. 90, 345; *Biedermanns Zentr.* 47, 279-80 (1918).—The very great diastatic power of saliva is noteworthy. B. speaks of an almost explosive decompn. With regularly increasing dilns. of the soln. of enzyme its action is retarded by approx. equal periods of time from which the conclusion is drawn that the time necessary for the decompn. of starch to dextrin by ptyalin is inversely proportional to the quantity of enzyme; also that the figures giving the diastatic power of the enzyme soln. (*i. e.*, the quantities of starch decomposed by 1 cc. of undild. saliva in a definite time) are directly proportional to these times. Sugar formation does not proceed parallel with dextrin formation but is slower as the amt. of enzyme diminishes. It may be regarded as certain that the hydrolysis of starch by the ptyalin of human saliva, and consequently by diastatic enzymes, takes place in steps since dextrin formation reaches a certain stage before maltose can be formed. This phenomenon can only be explained by the supposition that diastatic enzymes consist of 2 components, an amylase which splits the starch mol. to dextrans and a "dextrinase" which attacks the dextrin. The diastatic enzyme is not absolutely resistant to boiling, yet the diastatic power cannot be destroyed by mere boiling. On repeated addition of starch to the boiled enzyme soln. a regeneration of enzyme (if not a new formation of diastase) took place. Samples thus strengthened immediately lose their newly acquired diastatic power when boiled for a very short time. B. believes that the new formation of enzyme from starch under the influence of the salts of saliva ash is proved by his expts. **II. The autolysis of starch.** *Idem.* *Wochschr. Brau.* 1917, No. 34, pp. 183-6.—See C. A. 11, 1436.

ALBERT R. MERZ.

**Passage in vitro of rabic virus into the brain and other organs.** P. REMLINGER. *Compt. rend. soc. biol.* 81, 55-7 (1918); cf. C. A. 12, 1990.—When the brains of rabbits and guinea pigs which had died of rabies were washed with physiol. NaCl soln. and immersed in neutral, sterilized glycerol the rabic virus passed into non-rabic brains, liver and kidney immersed in the same liquid in contact with the rabic brains.

H. S. PAINE.

**Biophotogenesis and natural synthesis of luciferin.** RAPHAEL DUBOIS. *Compt. rend. soc. biol.* 81, 317-9 (1918); cf. C. A. 12, 1898.—D. proposes the following statement of the essential known facts of biophotogenesis with the following hypothesis to explain these facts: A thermolabile substance (luciferase) exhibiting the general characteristics of enzymes (and especially oxydones) produces physiol. luminescence in the presence of O and H<sub>2</sub>O *in vitro* by its interaction with a less thermolabile substance (luciferin). Luciferase may be replaced by other oxidizing substances such as KMnO<sub>4</sub>, PbO<sub>2</sub>, etc. This action is no longer produced when the aq. soln. of luciferin has been heated to 70-80° (temp. varying with the compn. of the vehicle); the liquid heated to 100° no longer produces luminescence with KMnO<sub>4</sub>. The characteristic photogenic property of luciferin may reappear in the photogenic mucus heated at 100° if, after cooling, it is placed in contact for several hrs. with the enzyme coluciferase. Since the latter ordinarily accompanies luciferase this is possibly a case of the reversible action of a single enzyme. Coluciferase may be readily extd. by macerating fragments of the luminous organs (*e. g.*, of *Pholas*) in alc. or Et<sub>2</sub>O, rehydrating slightly and then macerating 48 hrs. in neutral glycerol. Luciferase is destroyed by this treatment; luciferin is not sol. in glycerol and only coluciferase is found therein. This liquid (A) does not produce luminescence with KMnO<sub>4</sub>. The alc. or Et<sub>2</sub>O ext., when filtered and evapd., leaves a turbid aq. soln. This liquid (B) after filtration gives no more luminescence than (A) with the oxidizing agents mentioned. The property of producing luminescence

after addition of  $\text{KMnO}_4$  reappears when (A) and (B) are mixed, dild. with 2 parts of  $\text{H}_2\text{O}$ , and allowed to stand 10–12 hrs. (B) contains a substance which is provisionally termed "preluciferin." This result may be produced by substances (e. g., Byla peptone, lecithin, taurine, tyrosine, asparagine, esculin) other than soln. (B) These substances, and doubtless others, probably contain a nucleus which interacts with coluciferase again to produce preluciferin. The latter is then transformed by the oxidizing action of luciferase. This reaction of oxyluminescence takes place in 2 stages as shown by the following expt: When  $\text{PbO}_2$  is added to a soln. of luciferin luminescence is quickly produced. When this luminous mixt. is filtered there is obtained a clear, luminous liquid which contains no trace of Pb. This liquid contains a substance, termed "oxyluciferin," which is spontaneously oxidizable in the presence of free O only. The succession of the various phases of bioluminescence may be represented, viz., (1) coluciferase + preluciferin = luciferin; (2) luciferase + luciferin = oxyluciferin; (3) oxyluciferin + O = light. These various relations explain the results obtained by Harvey, particularly when he mixes certain non-oxidizing substances or exts. of non-photogenic organs or non-luminescent organisms with a spontaneously extinguished photogenic liquid. Products of incomplete oxidation such as taurine which are present in abundance in *Pholas dactylis* serve for the renewed production of luciferin and oxyluciferin and this cycle explains the great production of light by insects such as the *Pyrophori* which are capable of producing light for several days with access only of  $\text{H}_2\text{O}$  and air and without excretion of either solid or liquid. The above facts may also be applied to greater or less extent to the explanation of more fundamental phenomena of plant and animal nutrition such as enzymic synthesis of proteins. H. S. PAINE.

**Peroxidases.** RICHARD WILLSTÄTTER AND ARTHUR STOLL. *Ann.* 416, 21–64 (1918); *J. Chem. Soc.* 114, I, 555–7.—W. and S. have set themselves the task of so improving the methods of isolating and purifying enzymes that the following questions may be answered: (1) whether enzymic activity is possessed by an analytically pure compound or whether an "enzyme" is a system of coöperating substances; (2) whether a metal is an integral part of an enzyme; and eventually, (3) what atomic groupings are associated with enzyme activity. As a preliminary study, the case of horse-radish peroxidase has been chosen. For the isolation of highly concd. peroxidase preps., the following scheme is recommended: (a) Thin slices of the roots (5 kg.) are kept for a few days in flowing water in order to remove the simpler products by dialysis through the cell walls. (b) The washed material is digested with oxalic acid soln. (40 g. to 10 l.) for a few hrs. By this means, the regulating influence of the living protoplasm is removed, the peroxidase is pptd., apparently adsorbed on coagulated protein material, and dialysis proceeds further, mustard oil being extd. in large quantities. So extensive is the dialysis, that the dried slices lose more than 25% in wt. and half of their mineral matter. (c) The material is crushed in a mill, washed on a filter with about 15 l. of  $\text{H}_2\text{O}$  containing 1.5 g. of oxalic acid, and then thoroughly pressed free from sap. The residue (1.5 kg.) is intimately triturated with  $\text{Ba}(\text{OH})_2$ , almost sufficient to overcome its acidity, then pressed again, and now treated with further quantities of  $\text{Ba}(\text{OH})_2$  to liberate the enzyme. Most of the Ba is retained by the fibers, but the expressed liquid is just acidified by  $\text{CO}_2$  to remove the remainder, and then the filtrate is mixed with 0.9 of its vol. of alc. Slimy substances are pptd. and the filtrate is evapd. to 50–70 cc. *in vacuo* from a bath at  $50^\circ$ . The residue is filtered again, and then mixed with 5 vols. of alc., whereby the crude enzyme is pptd. This is purified a little more by redissolving it in water containing a trace of  $\text{H}_2\text{SO}_4$  and repptg. it by alc. (d). The crude material is found to be a mixt. of the enzyme with a nitrogenous glucoside, which can be pptd. as a compd. with  $\text{HgCl}_2$ . Accordingly, an aq. soln. is treated with 0.5%  $\text{HgCl}_2$  and a trace of  $\text{CaCl}_2$  to coagulate the jelly-

like double compd., the mass is filtered, and the enzyme is reprecipitated by alc. from the filtrate. The peroxidase is then dissolved in  $H_2O$ , whereby some of the  $HgCl_2$  compd. remains undissolved, the clear soln. obtained by centrifuging is reprecipitated by alc. and the process repeated until the enzyme dissolves clearly in  $H_2O$ . The best prepn. obtained so far amounted to 0.45 g. from 5 kg. of horse radish, this representing about 60% of the enzyme originally present. The glucoside compd. is decomposed by 2 *N* HCl and the glucoside obtained by precipitating the soln. with alc. amounts to 3.4 g. In order to control the above operations, a method for estimating peroxidase was developed. It depends upon the production of purpurogallin from pyrogallol and  $H_2O_2$ , but is free from certain errors which are present in Bach and Chodat's method (*Ber.* 37, 1342(1904)). It is found that peroxidase is not only spoiled by too great a concn. of H-ions, but by too concd.  $H_2O_2$ , and it is only fair, therefore, in devising an analytical method, to choose conditions under which the enzyme is not impaired. The method proposed is as follows: A soln. of 5 g. of purest pyrogallol in 2 l. of  $H_2O$  is mixed with about 10 cc. of 5%  $H_2O_2$  containing exactly 50 mg. of  $H_2O_2$ , regulated to 20° in a thermostat, and then treated with 1-5 cc. of a soln. of 5 mg. of the enzyme in 100-500 cc.  $H_2O$  (that is, from about 0.25 mg. of the crude prepn. to about 0.02 mg. of the best prepn.). After exactly 5 min., the action is stopped by adding 50 cc. of dil.  $H_2SO_4$ , and the purpurogallin is extracted with  $Et_2O$  and estimated colorimetrically by comparison with a soln. containing 100 mg. of the pure pigment in 1 l. of  $Et_2O$ . The results are then translated into the no. of mg. of purpurogallin which would be produced by 1 mg. of the vacuum-dried prepn. This is called the 'purpurogallin number.' For example, the no. for the well pounded horse radish is 0.25, for the crude prepn. before treatment with  $HgCl_2$  about 360 and for the best specimen yet obtained about 670. In a soln. of  $CO_2$ , the enzyme is not impaired but produces about half as much purpurogallin as in pure  $H_2O$ . It appears as though the particular grouping in the enzyme at which the  $H_2O_2$  may be attached is also capable of uniting with acids. Solns. of the preps. which have not been purified by  $HgCl_2$  become somewhat more active after a few hours, but the solns. of the purified enzyme deteriorate. Consequently, any comparisons of activity are made immediately after dissolving the preps. The yield of purpurogallin obtainable from pyrogallol has often been discussed. For instance, Nierenstein and Spiers obtained 10-16%. If the pyrogallol soln. is concd., the amt. of peroxidase employed is large, and the  $H_2O_2$  is added very slowly, so that it is always present in very low concn., the yield may be as high as 80%. Some reactions and analytical data concerning the purest enzyme and its companion glucoside are also recorded. The enzyme appears to consist chiefly of a nitrogenous glucoside, containing a pentose (above 30%) and an equimol. quantity of another sugar, probably a hexose. It does not seem to be very complex, and if it contains only the residues of the 2 sugar mols., its mol. wt. would be about 500 and no. of N atoms 3. It also contains about 5.5% of mineral ash, consisting of alkaline earths and Fe. The amt. of the latter is very small (0.46% of the best prepn.) but it rises with the purification of the enzyme. It is unlikely, however, that Fe plays any stoichiometrical part in the production of purpurogallin, for it may be calculated that the activity of the best prepn. would mean the consumption of 297-355 mols. of  $H_2O_2$  in 1 sec. for every atom of Fe present. Furthermore, the addition of Fe salts has no influence on the reaction. The companion nitrogenous glucoside, which is precipitated by  $HgCl_2$ , is a high-mol. compd. Its vapors give the pyrrol reaction, and it also gives the Millon and xanthoproteic reactions. It contains about 50% of pentose residues and a hexose, and the proportion of N is about 3 atoms to every 2 pentose mols. Oxyhemoglobin has often been compared with peroxidase and Wolff and de Stoëcklin have even stated that they do not differ in peroxidative activity. This is chiefly because rich peroxidase preps.

had not been employed hitherto, for oxyhemoglobin is only about 0.001 part as active as a quantity of peroxidase containing the same amt. of Fe. Fe compds., such as the tannate or a ferrocyanide or sulfate, are also very feeble in their activity as compared with peroxidase.

C. J. WEST.

Energetic oxidation of cholesterol by nitric acid (WINDAUS) 10.

MACLEOD, JOHN JAMES RICKARD, PEARCE, ROY GENTRY, *et al.*: **Physiology and Biochemistry in Modern Medicine.** St. Louis: C. V. Mosby Co. 903 pp. \$7.50.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

The examination of the blood preliminary to the operation of blood transfusion.

A. F. COCA. *J. Immunology* 3, 93-100(1918).

G. T. C.

The isolation, purification and concentration of immune bodies; a study of immune hemolysin. M. KOSAKI. Tokyo, Japan. *J. Immunology* 3, 109-29(1918).—The reversibility of the antigen and amboceptor union is proved to be practically complete so far as the immune hemolysin of the rabbit against sheep blood is concerned. The isolation of hemolytic amboceptor from its antigen union is accomplished by a simple method. When the hemolytic power of the original immune serum is 1:10,000 it is dild. 100 times with physiol. salt soln., and 5 cc. of this dild. serum are poured into 4 cc. of blood cells, which are washed free from serum protein with physiol. salt soln. After 15 to 20 min. at room. temp. all of the hemolytic amboceptor has been absorbed by blood cells, and the antigen-amboceptor union is thus obtained. After the sensitized corpuscular sediment is washed with physiol. salt soln. several times till the last trace of serum protein has been removed, this pure antigen-amboceptor combination is mixed with an isotonic or slightly hypertonic aq. soln. of saccharose, glucose or lactose and left at 55° for 15-30 mins., during which the vessel is shaken several times. The sugar ext. which contains nearly all of the hemolysin used to sensitize the cells is obtained by centrifugation. In order to purify this sugar ext., which contains substances from destroyed blood cells, it is placed in a separatory funnel and shaken for 1 to 2 hrs. with 5-10 vol. of ether, repeating this treatment until the soln. is colorless. This colorless soln. is dialyzed in parchment against running water to eliminate the sugar and traces of NaCl. The soln. thus obtained is concd. *in vacuo* to the required vol.

GEO. T. CALDWELL.

A note on bleeding guinea pigs and on preserving sheep erythrocytes. J. J. WENNER. Yale Univ. *J. Immunology* 3, 389-93(1918).—The animal is suspended from a support by means of a cord fastened to its hind legs and at once held by its head with the left hand. A cut is made over the jugular vein with scissors and the vein partly severed. The bleeding quickly stops when the animal is placed on its back. Freshly washed sheep corpuscles are dild. with an equal quantity of saline soln. To this suspension formalin is added in the proportion of one part of formaldehyde to 500 parts of the suspension. The formalinized washed corpuscles are well shaken and placed in the ice box, where they are well preserved for two weeks, and furnish a ready supply of erythrocytes for complement fixation work.

GEO. T. CALDWELL.

A convenient dilution chart of use in serologic and other tests in which varying quantities of reagents are employed. L. B. TABER. Berkeley, Calif. *J. Lab. Clin. Med.* 4, 138-40(1918).

GEO. T. CALDWELL.

A new indicator for direct reading of hydrogen-ion concentration in growing bacterial culture. J. BRONFENBRENNER. Harvard Univ. *J. Med. Res.* 39, 25-32 (1918).—As indicator a mixt. of china blue and rosolic acid is used. On account of its slow response to hydrogen-ion concn. this indicator cannot be used for ordinary titrations without the application of heat, in which case readings are made only after cool-

ing. This indicator is prepd. by mixing equal parts of 0.5% aq. soln. of china blue with 1% soln. of rosolic acid in 95% alc. The mixt. can be added directly to media and permits direct estimation of H-ion concn. in the culture at all times. Even in concn. 25 times that present in the media the indicator shows no trace of bactericidal action.

GEO. T. CALDWELL.

**A modification of Webster's test for the presence of T. N. T. in urine.** F. TUTIN. *Lancet* 1918, II, 554.—The urine is first extd. with two successive portions of  $\text{Et}_2\text{O}$ . It is acidified with  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  and again extd. with  $\text{Et}_2\text{O}$ . The ethereal ext. of the acidified urine must then be extd. twice with dil. aq.  $\text{Na}_2\text{CO}_3$ , washed with water and then treated with alc.  $\text{KOH}$ , when the characteristic violet color will be produced if derivs. of T. N. T. were present.

GEO. T. CALDWELL.

**Morphology of the epithelial cells in urinary sediment.** GEORGES RODILLON. *Sens. Bull. sci. pharmacol.* 25, Pt. 2, 265-74(1918).—Illustrations and a table are given, with full discussion.

M. HEIDELBERGER.

**Localization of morphine in the human body.** HENRI MARCELET. Chem. lab. of the 15th Region. *Bull. sci. pharmacol.* 25, Pt. 2, 292-5(1918).—Report of colorimetric tests on the organs of an addict, using the Stas-Otto-Dragendorff technic to isolate the alkaloid. The reagent of Boutmy, Brouardel, and Gautrelet (no ref.) permits a rough approximation of the relative amt. of morphine in the organs, the following results being obtained: Liver, ++++; stomach, +++; kidneys, +++; heart, +; brain, +; lungs, +.

M. HEIDELBERGER.

**Demonstration of indican in the urine by a new method.** K. TAKEUCHI. *Tokyo Igakukai Zasshi* 31, No. 19, 1-36(1917); *Jap. Med. Literature* 3, 74(1918).—The reagent is an aq. soln. containing 8.3 g.  $\text{KI}$ , 8 g.  $\text{I}$ , 6 g.  $\text{KBr}$  in each 100 cc. The urine (5 cc.) is treated with  $\text{Pb}$  acetate, then mixed with several drops  $\text{AcOH}$ , 2 to 3 cc.  $\text{CHCl}_3$ , 1 to 3 drops of the reagent, and shaken several times; 5 to 6 cc. concd. fuming  $\text{HCl}$  are added, and the soln. is shaken; the  $\text{CHCl}_3$  layer is drawn off, washed with  $\text{H}_2\text{O}$  to remove acid, then treated with a few drops  $\text{Na}_2\text{S}_2\text{O}_3$  soln. to remove  $\text{I}$ . The indigo blue, produced from the indican, colors the  $\text{CHCl}_3$ ; the method may be made the basis of a colorimetric detn. of indican. Alk. urine must be acidified with  $\text{AcOH}$  before the test is applied; otherwise the indigo, when formed, will be decomposed by the  $\text{I}$  and alkali.  $\text{I}$  is a more suitable oxidizing agent than  $\text{Cl}$ ,  $\text{Br}$ ,  $\text{CrO}_3$ , and  $\text{H}_2\text{O}_2$  in this reaction, since it converts all the indoxyl into indigo but does not carry the oxidation further. The method was sufficiently delicate to demonstrate the presence of indican in the first urine of a new-born child, and in the *liquor amnii* of 5 cases which were examd. In the presence of strong oxidizing agents, Obermayer's reagent was found to convert from 10 to 20% of the indican into isatin.

JOSEPH S. HEPBURN.

**Determination of sugar in milk and urine.** B. SJOLLEMA. Utrecht, Holland. *Chem. Weekblad* 15, 1483-5(1918).—The author calls attention to and describes the method of Folin and Dennis (*C. A.* 12, 1061) and cites the results of analyses to show that the method gives the same results as the longer "Codex" method.

WITHROW MORSE.

**Determination of uric acid in urine.** A. ANGIOLANI. *Boll. chim. farm.* 57, 223 (1918).—The method described contains no new features and does not appear to be accurate.

H. S. PAINE.

**Isotonic solutions.** E. I. VAN ITALLIE. Dutch Army. *Bull. sci. pharmacol.* 25, Pt. 2, 257-63(1918); cf. *C. A.* 12, 1104.—Since Schroeder (*Pharm. Weekblad* 1900, 600) very little has been published on the subject. Articles by Zotier (*C. A.* 11, 3080) and Lumiere and Chevrolier (*Soc. Therap. Paris*, Dec., 1913) are discussed and criticized. If the depression of the f. p. of a soln. is less than  $0.555^\circ$  it may be made iso-



tonic by adding the calcd. amt. of NaCl to bring the depression in the f. p. to this value. This may also be done less accurately, but sufficiently so for practical purposes, by the following calcs., using morphine hydrochloride (A) as example. The calcd. depression for 1 mol. substance in  $H_2O$  is  $18.6^\circ$ . Assuming (A) to be completely dissociated, the f.-p. depression of a 1% soln. of (A) will be  $(18.6 \times 2)/375.5 = 0.099^\circ$ . This, subtracted from  $0.555^\circ$ , leaves  $0.456^\circ$ , and to obtain this depression with NaCl (mol. wt. 58.5) one solves the equation  $0.456 = (18.6 \times 2)/58.5 \times x$ , and  $x = 0.72$  g. per 100 g. soln. By actual expt. 0.76 g. are required. A table is given showing the differences between the observed and calcd. f.-p. depressions of a number of salts commonly used for injection and of the observed and calcd. amts. of NaCl necessary to make these solns. isotonic. The importance of injecting only isotonic solns. is emphasized.

M. HEIDELBERGER.

Color reaction of steapsin on plates of gelose and emulsified fat by production of copper soap. P. CARNOT AND H. MAUBAN. *Compt. rend. soc. biol.* 81, 98-101 (1918).—The following technic is recommended: Prep. a 2:100 agar soln., mix with an equal vol. of 5:100 starch paste, incorporate in this mass about  $1/40$  of its vol. of the neutral fat desired (butter, lard, etc.), heat with const. agitation until a homogeneous emulsion is produced, pour into Petri dishes and cool rapidly. Distribute on the surface of the solidified mass with a fine pipet small drops of the liquid to be tested, keep 1 hr. at  $38^\circ$ , pour a satd. aq.  $CuSO_4$  soln. over the surface, allow to stand 10 mins. and rinse with  $H_2O$ . The presence of steapsin is shown by the appearance of beautiful bluish green spots; the addition of the starch, which is not indispensable, produces a rather white opaque background against which the spots appear very distinct. The use of butter and lard gave particularly good results; castor oil was saponified with difficulty. Intestinal juice (mixed with pancreatic juice and bile) withdrawn direct from the duodenum gave a very distinct positive test; after being heated to boiling it produced only a superficial yellowish stain which was readily removed by  $H_2O$ . This qual. test may be rendered approx. quant. by the method of successive dilns. The steapsin content of various human intestinal juices varied considerably; some gave a positive test when dild. 6-8:100, while others failed to give positive tests when dild. more than 25:100. The content of steapsin generally, but not always, showed a variation parallel to that of trypsin and diastase. Steapsin, probably due to reflux from the duodenum into the stomach, was detected in certain samples of gastric juice. No steapsin was detected in feces, even when passage through the intestines was accelerated by purgation. The official pancreatins of commerce, although rich in diastase and containing considerable trypsin, were found to contain little steapsin, the proportion found being hardly equiv. to the steapsin content of normal duodenal fluid dild. 1:10.

H. S. PAINÉ.

Use of certain reagents for determination of emetine in human urine. CH. MARTEL. *Compt. rend. soc. biol.* 81, 315-7 (1918).—M. studied the action of certain general (Dragendorff, Bouchardat, Tanret, Mayer-Valser) and special reagents. Results obtained by direct examn. of fresh urine free from albumin were unsatisfactory. A modified Milon method was used for extg. emetine, the  $CHCl_3-Et_2O$  ext. from the urine being washed several times, evapd. to dryness and the residue dissolved in 20 cc. of 2:100 HCl. Emetine was detd. quant. by estg. the vol. of ppt. (after centrifuging) or the degree of turbidity (when very small amts. were present) as compared with the corresponding data obtained with solns. containing various known concns. of emetine-HCl. It was possible with the general reagents to det. emetine-HCl when present in the following min. amts. in 5 cc. of liquid, this being the vol. used for comparison in all cases: Tanret, 0.0000125 g.; Mayer-Valser, 0.000025 g.; Dragendorff, 0.00005 g.; Bouchardat, 0.00005 g. The above values are equiv. to the following wts. of eme-

tine per l. of urine: Tanret, 0.0001 g.; Mayer-Valser, 0.0002 g.; Dragendorff, 0.0004 g.; Bouchardat, 0.0004 g. The orange-yellow color obtained by adding a very small amt. of  $\text{Ca}(\text{ClO})_2$  and about 3 drops  $\text{HCl}$  to the soln. to be tested permitted colorimetric comparison with the control solns.; the sensitiveness of the reaction was approx. 0.0002 g. per 5 cc. of the soln. to be tested or 0.0016 g. per l. of urine. This reaction is not suitable for quant. detn., since the color produced is transitory and the sensitiveness is not sufficiently great. Froehde's reagent, which can only be applied to the dry residue left after evapn. of the filtered  $\text{HCl}$  soln. of emetine, gives a sensitive reaction. The green color produced by addition of 2 drops of the sulfo-molybdic mixt. appeared with the min. concn. of 0.00005 g. emetine- $\text{HCl}$  per 5 cc., this being equiv. to 0.0002 g. per l. of urine. H. S. PAINE.

**Estimation of tryptic action by clarification of turbid emulsions of egg albumin.** P. CARNOT AND H. MAUBAN. *Compt. rend. soc. biol.* 81, 340-2 (1918).—An original soln. is prepd. by beating 1 part of egg white with 3 parts of 1:100 artificial serum and decanting after 24 hrs., a small piece of camphor being added for preservation. When the detn. of tryptic action is to be made 1 cc. of this liquid is dild. with 39 cc. of distd.  $\text{H}_2\text{O}$  and the mixture is heated several mins. at  $90^\circ$ ; a uniform turbidity without any subsequent deposition is produced. Four cc. of the final liquid are placed in each of a series of tubes; to the successive tubes are added an increasing no. of drops (1-10) of the liquid to be tested. The tubes are kept at  $37^\circ$  and the time required for disappearance of turbidity in each instance is noted. In the case of duodenal fluid complete clarification occurred in a few mins. in tubes containing 7-10 drops and in 1-3 hrs. in the tube containing 1 drop. Attempts to use Mett tubes containing ovalbumin for detn. of tryptic action were not satisfactory owing to the formation of a brown coating which covered the end of the cylinder of albumin and prevented further action; the method also lacked sensitiveness. This method was not greatly improved by substituting horse serum for ovalbumin; the increase in rate of attack on the former, as compared with the latter, was not great enough to cause sufficient increase in sensitiveness. Capillary tubes containing muscle exts. (steer, calf, chicken, pig) were also tested; although the sensitiveness was greater than with ovalbumin, at least 1 day was required for sufficient digestion to occur. More sensitive results were obtained with tubes containing 5-10:100 gelatin colored with eosin; considerable action was noted after 12 hrs. contact with duodenal fluid at ordinary temp., even in the case of the least active samples. H. S. PAINE.

**Sources of error in the detection of lactic acid in the stomach contents after a test meal.** P. GÉRARD AND REGNOULT. *Compt. rend. soc. biol.* 81, 388-9 (1918); cf. Pron, *C. A.* 13, 470.—Since the Uffelmann and Berg reactions are not sp. for lactic acid but are also influenced by compds. with primary and secondary alc. groups the glycerol employed for moistening the tube used for withdrawing the stomach contents may constitute an appreciable source of error. A more important source of error is found in the character of the bread used for the test meal. The liquid obtained by macerating 60 g. bread in 250 cc. distd.  $\text{H}_2\text{O}$  for 1 hr. and then filtering gave a positive reaction with both the Uffelmann and Berg reagents. The intensity of the reaction was not modified when the maceration was effected at  $37^\circ$  in the presence of pepsin and  $\text{HCl}$ . The crust and the crumb, when treated separately, gave the same reaction (positive). The filtrate obtained from the above maceration had in general an acidity equiv. to 0.01 N. This acidity was transferred in part to  $\text{Et}_2\text{O}$  when the latter was shaken with the filtrate. The aq. soln. of the residue remaining after evapn. of the  $\text{Et}_2\text{O}$  gave a negative reaction with the Uffelmann and Berg reagents; the original filtrate from the maceration still gave a positive reaction with these reagents after being extd. with  $\text{Et}_2\text{O}$ . When 0.10 g. lactic acid was added to 60 cc. of the filtrate from the bread macera-

tion and this soln. was extd. with  $\text{Et}_2\text{O}$  a sufficient amt. of lactic acid to give a distinctly positive reaction with the above reagents was dissolved by the  $\text{Et}_2\text{O}$ . The positive reaction obtained with the aq. maceration of bread does not appear to be due to lactic acid. This positive reaction was not obtained with all samples of bread. Whenever possible the bread selected for test meals should give no reaction with the Uffelmann and Berg reagents. If such bread is not available the test for lactic acid should only be made after extg. the stomach contents with  $\text{Et}_2\text{O}$ . H. S. PAINE.

**Syphilimetric indexes. Colorimetric determination of the digression from stability.** ARTHUR VERNES. *Compt. rend.* 167, 500-3(1918); cf. *C. A.* 13, 38.—V. makes an artificial scale for the colorimetric measurement of syphilitic infection as follows: 0.1% acid fuchsin, 10 cc.; 1.0% picric acid, 10 cc.; mixt. consisting of glacial  $\text{AcOH}$ , 4 cc., 40%  $\text{HCHO}$ , 2.5 cc.; and water up to 100 cc., 110 cc. This is called "liquid 8" and upon diln. with dil.  $\text{AcOH}$  in the proportions of 1 to 1, 1 to 2, 2 to 7, 4 to 23, 8 to 73, 16 to 227, 32 to 697, and 1 to 65 gives a scale of color running from 7 down to 0, resp. The clinical applications of the above measurements are discussed.

L. W. RIGGS.

**Method of preparing the eosinate of methylene blue and method for staining.** FOSTER A. BECK. U. S. Army. *J. Am. Med. Assoc.* 71, 1651(1918).—"The stain depends upon the formation of methylene azure and methylene violet in the alk.  $\text{MeOH}$  eosin methylene blue soln." The eosinates are dissolved in the  $\text{MeOH}$  and the water-sol. products are pptd. and removed by filtration. The materials and quantities employed, which must be accurately measured, are:  $\text{MeOH}$ , 95 cc.; 0.1 *N*  $\text{NaOH}$ , 5 cc.; water-sol. eosin (yellowish), 0.47 mg.; methylene blue, 0.4 mg. The  $\text{MeOH}$ ,  $\text{NaOH}$  and eosin are mixed in order, as soon as the eosin is dissolved, methylene blue is added and the mixt. shaken 30 min., then filtered and kept in a glass-stoppered bottle. It is ready for immediate use. The advantages are saving of time in the prepn. of the stain and in staining; tap water may be used in place of distd. water; for bacteriologic examns. this stain may be used instead of alk. methylene blue, and it is not necessary to heat to fix the specimen.

L. W. RIGGS.

**Color reaction in typhoid.** E. SILVESTRI. *Riforma medica* 34, 812(1918); *J. Am. Med. Assoc.* 72, 78.—The test is performed by floating 3 cc. filtered urine on a mixt. of 2 cc.  $\text{FeCl}_3$  and 4 or 5 drops pure  $\text{H}_2\text{SO}_4$ . At the zone of contact a brownish yellow tint appears and spreads upward. A ring of turbidity, with greenish reflections, forms on the surface but disappears on agitation, while the brownish yellow tint shows no change even on heating. If albumin or excess urates are present they should be removed before testing. The test is positive in the first days of typhoid or paratyphoid B and, though less pronounced, with paratyphoid A.

L. W. RIGGS.

**Experimental osmosis with a living membrane.** EDWARD KREMER. *Univ. Wis. Science* 48, 599-600(1918).—A dahlia stem in late fall was observed to be filled with water between the nodes. This suggests using a node and internode as an osmotic cell, the node acting as a living semipermeable membrane. Such a cell was improvised by capping the stem with a rubber stopper carrying a glass tube. The cell was filled with salt soln. and placed in water, whereupon the salt soln. rose 6 inches in the tube in less than 1 hr.

L. W. RIGGS.

**Ultrafiltration of small quantities of liquid by centrifugal force.** D. J. DE WAARD. *Arch. Néerl. de physiol.* 2, 530-3; *Chem. Weekblad* 15, 1361(1918).—Instead of high air pressure, the principle of centrifugal force is used in an app. designed for use with blood serums, etc. Ultrafiltration of very small quantities is possible with this app.

JULIAN F. SMITH.

**Ether which colors benzidine, a possible source of error in blood analysis.** F. WREHUIZEN. *Geneesk. Tijdschr. voor Nede. Indië* 58, 201-3; *Chem. Weekblad* 15,

1521(1918).—A warning against using  $\text{Et}_2\text{O}$ , without a control test, in the detection of small quantities of blood. The presence of  $\text{H}_2\text{O}$  is favorable to the formation of the substance in  $\text{Et}_2\text{O}$  which colors benzidine.

JULIAN F. SMITH.

**Volumetric determination of sulfates.** VANSTENBERGHE AND BAUZIL. *Ann. chim. anal.* 23, 210-4(1918).—The method, devised for the examn. of biological fluids is as follows: Treat a known vol. of the fluid with  $1/4$  of its vol. of 15%  $\text{Na}_2\text{CO}_3$  soln., heat to 60-70°, filter, and transfer 30 cc. of the filtrate to a flask. Slightly acidify with  $\text{HCl}$ , heat nearly to boiling, add 20 cc. of  $\text{BaCl}_2$  soln. (12.2 g. per l.), boil not over 1 min., and centrifuge, or filter through talc. To the filtrate add an excess of  $\text{Na}_2\text{CO}_3$ , centrifuge or filter, wash with  $\text{H}_2\text{O}$  until washings are neutral to litmus paper, wash the  $\text{BaCO}_3$  ppt. into a beaker, add 10 drops of 0.1% Me orange soln., and titrate with 0.1  $N$   $\text{HCl}$ . The end point is taken as the tint matching that obtained on adding 10 drops of the indicator and 0.5 cc. of 0.1  $N$   $\text{HCl}$  to an equal vol. of  $\text{H}_2\text{O}$  (0.5 cc. is therefore deducted from the buret reading). **Urine:** Remove the albumin from 100 cc. of the urine, treat at 60-70° with 20 cc. of  $\text{Na}_2\text{CO}_3$  soln., and filter. To det.  $\text{SO}_4^{--}$ , acidify 30 cc. of the filtrate with  $\text{HCl}$  and proceed as above outlined. Oxidized S is detd. in another 30 cc. of the filtrate after hydrolyzing the sulfo-ethers by boiling 15 min. with 3 cc. of  $\text{HCl}$  and 50 cc. of  $\text{H}_2\text{O}$ . Total S is detd. in 30 cc. of the filtrate after destruction of the org. matter by boiling (until decolorized) with 3 cc. of  $\text{KClO}_3$  soln. (0.3 g. in 25 cc.  $\text{H}_2\text{O}$ ). **Serum:** Dil. 10 cc. of serum with 40 cc. of 10%  $\text{NH}_4\text{Cl}$  soln., add a few drops of  $\text{AcOH}$ , heat to boiling to coagulate the albumin; filter through  $\text{Na}_2\text{CO}_3$ , wash the filter, evap. the filtrate to 10 cc., acidify with  $\text{HCl}$ , and continue as above, adding 5 cc. of the  $\text{BaCl}_2$  soln. **Blood:** Calcine 10 or 20 cc. of blood in a crucible with a mixt. of equal parts of  $\text{Na}_2\text{CO}_3$  and  $\text{KNO}_3$ , take up with  $\text{H}_2\text{O}$ , evap. to dryness, dissolve the residue in  $\text{HCl}$  and continue as with serum.

F. W. SMITHER.

**Analyses of blood gases. I. Qualitative and quantitative detection of acids in small quantities of blood by estimation and distribution equilibria.** H. STRAUB AND KLOTHILDE MEIER. *Biochem. Z.* 89, 156-77(1918); *J. Chem. Soc.* 114, II, 467-8.—The laws of mass action regulate the relationship between (a) the undissociated, (b) the dissociated parts of the electrolytes of the blood, and (c) the H-ion concn. If 2 of these are known, the 3rd can be calcd. A method is described for detg. whether acids stronger or near the strength of  $\text{CO}_2$  are present, which depends upon the soly. of  $\text{CO}_2$  in blood or serum. It consists in the detn. of the equilibria of distribution between  $\text{CO}_2$  and the non-volatile acids of the blood. The detn. of the abs. soly. of  $\text{CO}_2$  at a given partial pressure of the gas, or at a given H-ion concn., gives a means of estg. the amt. of pathological acids present in the blood. Various examples of the use of the method are given.

C. J. WEST.

**Volumetric estimation of histidine and other glyoxaline derivatives.** C. L. LAUTENSCHLAGER. *Z. physiol. Chem.* 102, 226-43(1918); *J. Chem. Soc.* 114, II, 466.—Histidine can be estd. by treating its soln. with an excess of diazobenzenesulfonic acid, boiling with alc. to destroy the excess of acid and then titrating the stable histidine dye with  $\text{TiCl}_3$  by Knecht and Hibbert's method. An alternative method consists in adding standard  $\text{AgNO}_3$  to the histidine soln. until a drop no longer gives a red coloration with an alk. soln. of diazobenzenesulfonic acid. As only the free base reacts with the acid to form a red dye, while the Ag salt gives no color reaction, the end-point is revealed by the non-appearance of the red color. For its detn. in protein, the histidine must 1st be sepd. from the other products of hydrolysis, especially tyrosine; this can be effected by means of Ag lactate or  $\text{HgCl}_2$ , which forms insol. compds. with histidine.

C. J. WEST.

**Estimation of the purin bases in nucleic acids after cleavage without the production of humin.** R. FEULGEN. *Z. physiol. Chem.* 102, 244-51(1918); *J. Chem.*

Soc. 114, II, 464.—The nucleic acid is heated with a soln. of  $\text{NaHSO}_4$  at  $160^\circ$  under pressure, whereby a colorless, humin-free hydrolysate is obtained. On cooling, the guanine seps. quant., while the adenine in the filtrate is pptd. as phosphotungstate, then converted into the  $\text{Ag}_2\text{SO}_4$  compd. and finally weighed as the picrate.

C. J. WEST.

Estimation of the residual nitrogen in blood serum. FISCHER. *Z. physiol. Chem.* 102, 266–74(1918); *J. Chem. Soc.* 114, II, 452.—In the detn. of the residual N in blood serum, it is essential that the proteins should be so completely removed by pptn. that no trace of the latter can be detected in the filtrate. This result can be achieved by pptg. with  $\text{AcONa}$  or  $\text{NaCl}$  in the presence of  $\text{AcOH}$  at  $100^\circ$ , or by treatment with uranium acetate at the ordinary temp. F. recommends the latter method, which yields values for the residual N varying from 20 to 90 mg. of N per 100 cc. of blood serum.

C. J. WEST.

Mistletoe (BONNAMOUR, NIQUET) 17. An iodine-tannin reagent (TSAKALOTOS, DALMAS) 7. Determination of dextrose with hypiodite (WILLSTÄTTER, SCHUDEL) 7.

### C. BACTERIOLOGY.

The bactericidal action of whole blood with a new technic for its determination. G. O. HEIST, S. SOLIS-COHEN AND M. SOLIS-COHEN. *J. Immunology* 3, 261–75(1918).—The serum of a pigeon does not differ in its action upon pneumococci from the serum of the mouse or the rabbit. If small numbers of living pneumococci are seeded by a suitable method in pigeon's blood before it coagulates, the pneumococci fail to multiply. On the contrary, if pneumococci are seeded in mouse or rabbit blood before it coagulates, they grow with great vigor. Fresh defibrinated blood of both immune and susceptible species is an excellent culture medium for the pneumococcus. This organism fails to multiply in the blood of a rabbit which has been suitably inoculated with killed pneumococci, the reaction being sp. to type. The blood of a man who has recovered from lobar pneumonia prevents the development of pneumococci belonging to the type causing his disease.

GEO. T. CALDWELL.

Methods of isolation and identification of the members of the colon-typhoid group of bacteria. Late fermentation of lactose. J. BRONFENBRENNER AND C. R. DAVIS Harvard Univ. *J. Med. Res.* 39, 33–7(1918).—An increase of lactose concn. above 1% in liquid media may greatly hasten the identification of organisms which ferment lactose slowly, after isolation from the plate.

GEO. T. CALDWELL.

Identification of tubercle bacilli using alcoholic alkali solutions as decolorizer. LOUIS BOURDY. Grenoble. *Bull. sci. pharmacol.* 25, Pt. 2, 296–8(1918).—A rapid, simple technic involving fixation and staining as usual with Ziehl's soln., washing with  $\text{H}_2\text{O}$  and decolorizing 3–5 min. in a soln. of 10 cc. officinal aq.  $\text{NH}_3$  and 90 cc. 96° alc., restaining preferably with Gabbet's soln. (2 g. methylene blue to 100 cc.  $\text{H}_2\text{SO}_4$  (1:4)) for several seconds, washing with  $\text{H}_2\text{O}$ , and drying. Excellent results are claimed with difficult sputa, urinary sediments, milk, butter, and feces.

M. H.

New culture medium for general use in human microparasitology. DOMENICO CROZZI. Firenze. *Sperimentale* 72, 291–308(1918).—Media hitherto employed for general use have been deficient owing to their prepn. from the flesh of animals, have been poor in free amino acids, free from vitamins, of unsuitable  $\text{H}^+$  concn., or have contained insufficient mineral salts or carbohydrates. The use of the human placenta is recommended as a material furnishing the necessary elements and one accessible without difficulty. The fresh placentas are thoroughly washed, comminuted with a meat chopper, weighed, placed in a flask with 2 parts by weight of Ringer-Locke soln., and treated with 1% of the total weight of pancreatin and 0.5%  $\text{CHCl}_3$ , after making sure that the alkalinity is the same as that of human blood (alk. to litmus but not to phenol-

phthalein). Generally after 24 hrs. digestion at 40-2° the biuret reaction is very weak and the tryptophan reaction very strong, and the mixt. is then filtered, first through cloth, then through paper, and the alkalinity is again tested as above and corrected if necessary. For use as broth the yellow liquid is steamed 1 hr., filtered again, the alkalinity again controlled, and 0.5% glucose and 2% glycerol added, followed by sterilization. Agar and gelatin media are prepared from the liquid in the usual way. 3 drops of unheated human blood are added to each tube immediately before use in order to supply vitamins; after the 1st transplantation and in the case of the more resistant microorganisms this addition is unnecessary. Good results are claimed with anaerobes as well as aerobes, rapid growth, long life, and late development of degenerative forms being obtained even with the bacteria ordinarily considered difficult to cultivate.

M. HEIDELBERGER.

**Action of fruit juices upon the typhoid bacillus.** R. KO. *Taiwan Igakukai Zasshi* 179, 569-80(1917); *Jap. Med. Literature* 3, 73(1918).—Most fruit juices, which are acid, exert a bactericidal action on *B. typhosus*; juice of half-ripe fruit usually is more efficient than that from fully ripe fruit. "Tannic acid is the strongest of the vegetable acids, followed by citric and tartaric and finally by malic. Sugars and starches have no antiseptic action no matter how strong." "Lemonades" prepd. from the acids have considerable bactericidal action, most marked in those containing HCl, less marked with tartaric acid or H<sub>2</sub>SO<sub>4</sub>, and least marked with citric acid. Fruits whose juices do not favor the viability of *B. typhosus*, are: *Ananas sativus*, *Pisidium gayana*, *Eugenia javanica*, *Diospyros kaki* (persimmon), *Musa sapientum*, *Nephelium litchii* (litchii nut), *Vitis vinifera* (grape), *Prunus persica* (peach), *Prunus communis*, *Citrus decumana*, *Myrica rubra*, *Averrhoa carambola*. Fruits whose juices do not kill *B. typhosus*, are: *Nephelium longana* (longan fruit), *Citrus nobilis* (navel orange), *Eryobotrya japonica* (Biwa), *Mangifera indica* (mango), *Citrullus vulgaris* (watermelon), *Eigen cariae*, *Pyrus sinensis* (pear).

JOSEPH S. HEPBURN.

**A chromogenic bacillus from a case of roup.** B. F. KAUPP. N. C. Agr. Expt. Sta. *J. Infect. Dis.* 23, 568-71(1918).

JULIAN H. LEWIS.

**A plate method for isolating anaerobes.** GEORGE F. DICK. St. Luke's Hosp., Chicago, Ill. *J. Infect. Dis.* 23, 578-9(1918).

JULIAN H. LEWIS.

**Consideration of methods for demonstrating tubercle bacilli in the urine.** ERNEST M. WATSON. *Am. J. Med. Sci.* 156, 636-43(1918).—The methods of Walker, Uhlenhuth, Ellerman and Erlandsen, Lange and Nitsche, Kozlow, Petroff and that of Crabtree are given briefly. The present method herein described involves centrifuging urine collected from a patient who has had the intermittent organ washed, previously, with sterile water and the ureter irrigated. Antiformin is used where there is much sedimentation. Smears are made from the sediment stained with carbo-fuchsin, decolorized in HCl (2%) and counterstained with Löffler. A guinea-pig test may be positive when the above method is negative.

W. MORSE.

**Effect of heat on the spores of *Bacillus botulinus*.** GEORGINA SPOONER BURKE. Stanford Univ. *J. Am. Med. Assoc.* 72, 88-92(1919); cf. Dickson and G. E. Burke, *C. A.* 12, 2087.—Ten strains of *B. botulinus* were studied. The technic is given in detail and the results assembled in five tables. The most important conclusions are as follows: Free spores of *B. botulinus* grown in either broth or brain cultures are highly resistant to heat, those from brain cultures being the more resistant. A temp. of 100° or more inhibits the development of the spores so that the incubation period is very much increased. None of the household methods of canning will kill the spores of the more resistant strains of *B. botulinus*. Fractional sterilization on three successive days is of doubtful value because the first exposure to 100° for 15 min. retards the germination of the spores so that they do not develop before the third sterilization period.

Canning under pressure at prolonged periods may render the food sterile, but a pressure of 15 pounds for 10 min. does not kill the more resistant spores. The source of *B. botulinus* is not at present known, but it is quite certain that it is not under the skin of perfectly sound fruit and vegetables that are not over-ripe. Such fruit and vegetables should be washed before peeling and every detail of cleanliness, including the elimination of flies, be observed throughout the process. The contents of the jar must not be tasted "to see if it is spoiled," as the smallest taste is fatal if the toxin is strong. Canned food should be condemned if there are bubbles inside the jar and gas or liquid escapes as the top is unscrewed; if the odor somewhat resembles that of rancid cheese; or if the solid portions have a mushy disintegrated appearance. The toxin of *B. botulinus* may be entirely destroyed by boiling five min. although the spores are not killed by this treatment. It is the toxin and not the spores that produces illness, for the bacilli do not produce toxin when taken into the body. Since *B. botulinus* produces toxin only in material that has been sealed in an air-tight container for a week or more, there is no danger of botulism from uncooked or freshly cooked fruit or vegetables.

I. W. RIGGS.

Theory and practice of disinfection by alcohol. JOHANNE CHRISTIANSEN. *Z. physiol. Chem.* 102, 275-305 (1918); *J. Chem. Soc.* 114, I, 564; cf. *C. A.* 12, 1990.—The disinfecting power of alc. depends not only on its ability to ppt. the proteins of bacteria but on its capacity to penetrate the cell walls, and thus exert its action on the protoplasm of the bacteria. The latter quality is dependent on the surface tension of the alc. Propyl alc. seems to be the most suitable of all the alcs. for direct application to the skin as a means of disinfection prior to surgical operation. Its toxicity is considerably greater than that of EtOH, and on account of its dissolving power over fats, it is able to enter readily the pores of the skin.

C. J. WEST.

#### D. BOTANY.

CARL L. ALSBERG.

Immunity of plants against compounds which they produce. RAOUL COMBES. *Compt. rend.* 167, 275-8 (1918).—A study of the effect of the glucoside agrostemma-saponin upon rose-campion (*Agrostemma githago*), peas (*Pisum sativum*), buckwheat (*Polygonum fagopyrum*), and radishes (*Raphanus sativus*). Knop's soln. alone was used, and also with 0.10, 0.25, 0.50, 1.0, 2.0 and 10 parts per 1000 of the saponin added. Injurious effects were noted on the last 3 named plants even in the dil. concns., while even the concd. solns. produced no ill effects upon *Agrostemma githago*. It is noteworthy that this last-mentioned plant produces the glucoside under study, and that it is not produced by the other three. C. concludes that it is not advisable from the standpoint of plant physiology to study the effects of sp. compds. upon plants not producing them and draw conclusions therefrom as to the part they play in the tissues of species which, in nature, do produce them.

R. B. DEEMER.

Chemical changes accompanying abscission in *Coleus blumei*. HOMER C. SAMPSON. *Bot. Gas.* 66, 32-53 (1918).—Abscission of leaves in *Coleus blumei* is the result of the conversion of cellulose into pectose, and this is further changed into pectin and pectic acid. The amt. of pectic acid formed is in excess over that of the available calcium sufficient to maintain the solidity of the middle lamella of the cell walls of the abscission layer. These processes are perhaps initiated and probably accelerated by the presence of oxidases and ferric ions, both of which accumulate in the abscission layer.

B. HARROW.

Contributions to the knowledge of the carbohydrates of vegetables. ERNST BUSOLT. *J. Landw.* 64, 357 (1916); *Biedermanns Zentr.* 47, 287 (1918).—B. had previously sepd. mannitol from aq. exts. of asparagus, green French beans and cauliflower and mannitol and dextrose from savoy. In this investigation he obtained mannitol

and dextrose from *carrots* in a similar manner. Besides proving mannitol and dextrose present in aq. exts. of green *peas* the presence of fructose and glucuronic acid was shown.

ALBERT R. MERZ.

Spectral Analysis of the plant coloring matters of the flavone group (Shibata, Kimotsuki) 10.

#### E. NUTRITION.

PHILIP B. HAWK.

##### NORMAL.

The constancy of the protein quotient during intensive digestion and prolonged starvation. S. HANSON. *J. Immunology* 3, 67-74(1918).—The object of the expts. performed was to det. the influence on the protein quotient of a disturbance or metabolism produced by periods of digestion alternating with prolonged periods of starvation, using rabbits as the exptl. animal. The quotient was found to remain normal during the digestion periods.

GEO. T. CALDWELL.

The relative content of antiscorbutic principle in limes and lemons. HARRIETTE CHICK, E. MARGARET HUME AND RUTH F. SKELTON. *Lancet* 1918, II, 735-8.—The antiscorbutic value of the juice of fresh limes is distinctly inferior to that of fresh lemons. The former has a potency of about  $\frac{1}{4}$  that of the latter. Preserved lime juice was found useless for the prevention of scurvy in young monkeys.

GEO. T. CALDWELL.

The influence of diet on teeth formation. MAY MELLANBY. Univ. London. *Lancet* 1918, II, 767-70.—A diet containing in abundance those articles with which the fat-soluble A accessory food factor is associated, *e. g.*, cod liver oil, butter, allows the development in puppies of sound teeth. A diet otherwise adequate but deficient in these substances brings about the following defects in puppies' teeth: (a) delayed loss of the deciduous teeth, (b) delayed eruption of the permanent teeth, (c) irregularity in position and overlapping, especially of the incisors, (d) partial absence of or very deficient enamel, (e) low Ca content of the teeth. These results cannot be considered as being due to acute illness or "malnutrition," for the improvement of the teeth by the addition of substances containing fat-soluble A is as characteristic as the deleterious effect of a deficient diet. There is evidence that the defective teeth are most pronounced in the rapidly growing puppies.

GEO. T. CALDWELL.

The antiscorbutic value of the raw juices of root vegetables with a view to their adoption as an adjunct to the dietary of infants. HARRIETTE CHICK AND MABEL RHODES. *Lancet* 1918, II, 774-5.—Cow milk preserves distinct antiscorbutic properties, but these are present in small degree in comparison with other antiscorbutic food-stuffs. Its value in this respect is further reduced after heating or drying. Various materials that might suitably be included in an infant's diet were tested exptly. on guinea pigs. Among fresh fruit juices that of the orange is easily the most suitable and possesses a value about 10 times as great as that of fresh grapes. Of the raw vegetable juices examd., raw swede juice is far the most potent, approxg. in value to raw orange juice. The raw juice of carrots is much inferior, and that of beet roots fails to prevent scurvy in the largest dose (20 cc.) that can be administered to the exptl. animals.

GEO. T. CALDWELL.

The value of germinated beans in the treatment of scurvy. H. W. WILTSHIRE. *Lancet* 1918, II, 811-3.—Germinated beans were found quite as potent as raw lemon juice in the treatment of scurvy. In cooking vegetables the destruction of the vitamins cannot be ascribed to the production of alkalinity.

GEO. T. CALDWELL.

Relative morbidity of breast and bottle-fed infants. H. M. McCLANAHAN. Omaha, Neb. *Arch. Pediatrics* 35, 652-60(1918).—Breast milk contains natural anti-



bodies, and thereby renders the infant fed less susceptible to infections (except influenza and tuberculosis), increases the resistance if infection occurs, and decreases the morbidity. Breast milk is digested by the infant more rapidly and with less work by the digestive organs than is modified cow milk. Hence breast milk is superior to cow milk as an infant food.

JOSEPH S. HEPBURN.

**Somatose.** WILLIAM THOMSON. *Mem. and Proc. Manchester Lit. Philos. Soc.* 62, Part 1, Memoir 5, 14 pp. (1918).—Somatose, an invalid food, is prepd. from the residue obtained on extn. of meat with hot water. The residue is heated with water for some time at a pressure of 90 lbs. to the sq. in. (320° F.), and dissolves to a large extent. The soln. is filtered, evapd. to dryness, and powdered. The brownish product is somatose; it contains 13.13% N. Tame mice were the exptl. animals. They gained wt. on rations of (1) oats and water, (2) oats, lean meat, and water, and (3) oats, plasmon (casein), glucose, and water, and lost wt. on rations of (4) oats, somatose, glucose, and water, (5) oats, port wine residue (total solids), and water, and (6) oats, water, and residue from port wine which had contained somatose in soln. The loss in wt. was greater on ration (6) than on ration (5) during a feeding period of 19 days. Mice fed ration (4) minus somatose remained at or above their initial body wt. The conclusion is reached that somatose is neither a food nor a neutral body, but an irritant producing gastric disturbance and diarrhea. Expts. are also reported in which mice were fed a diet of oats, water, and a species of raw starch. After ingestion of either potato- or sago-starch, large quantities of intact starch granules, and some slightly digested, were excreted in the feces which had a white color. When the ration contained either maize- or tapioca-starch, a small quantity of intact starch granules was present in the feces. Apparently both rice- and wheat-starch were completely digested by the mice.

JOSEPH S. HEPBURN.

**Food requirements of the Japanese people as indicated by prison dietsaries.** R. INABA AND T. UYENO. *Tokyo Igakukai Zasshi* 31, No. 20, 3-20 (1917); *Jap. Med. Literature* 3, 75-6 (1918).—A prisoner at full labor received a daily grain ration of 4.2 go of rice and 1.8 go of barley; 1 go = 180 cc. This was supplemented with vegetables as soups or boiled mixts., with sea weed, pumpkin, potatoes, bean curd, and fish occasionally; meat was not given. The ration had the following daily value; figures in parentheses represent the amt. utilized: N 17.31 g. (12.59 g.), protein 108.21 g. (78.59 g.), fat 34.67 g. (28.50 g.), carbohydrate 556.97 g. (552.05 g.), cal. 3050 (2850). Expts. were made to ascertain the exact diet required for maintenance of wt. under these conditions, the only variable being the amt. of rice and barley in the ration. Seven prisoners were studied separately. The max. and minimum values obtained during maintenance of wt. and a positive N balance included 76.07 and 108.21 g. protein daily, 29.5 and 43.7 cal. per kg. of body wt. daily.

JOSEPH S. HEPBURN.

**Nitrogen partition in the urine of dogs fed on different substances and subjected to strenuous exercise at high temperatures.** N. GORO. *Tokyo Igakukai Zasshi* 32, No. 4, 51-8 (1918); *Jap. Med. Literature* 3, 78 (1918).—A diet of Kara (the refuse from beans in the manuf. of Tofu or bean curd) increased the  $\text{NH}_3$  of the urine to 10 to 20 times the normal amt., and decreased the urea, but produced no change in the total N of the urine; it caused the excretion of acetone and diacetic acid in considerable amt. A diet of egg white increased the amino acid N to approx. 6 times its normal value, made no change in the  $\text{NH}_3$ , and caused a slight reaction for acetone and diacetic acid in the urine. Sugar produced an increase in body temp. and in amino acid N,  $\text{NH}_3$ , uric acid (to 3 times normal), and purine bases (to approx. 8 times normal); during rest at room temp., the urea gradually returned to its normal value.

JOSEPH S. HEPBURN.

**Influence of fats upon the toxicity of food proteins; their role in the utilization of nitrogenous materials. Therapeutic applications.** F. MAIGNON. *Compt. rend.* 167,

281-3(1918).—The conclusions of the previous recent papers (cf. *C. A.* 12, 2001-2) are restated. In support of these exptl. results the evidence of clinical observation is added, which confirms the hypothesis of the intervention of fats in the metabolism of nitrogenous foods. Among such observations may be mentioned cod-liver oil in cases of tuberculosis and of those affections accompanied by N denutrition; also the substitution of fats for carbohydrates in diabetes. L. W. RIGGS.

**Soldier's ration and physiology.** F. RHO. *Riforma medica* 34, 561(1918); *J. Am. Med. Assoc.* 71, 1256.—A reply to Bottazzi's arguments (cf. *C. A.* 12, 2603) and a discussion of the physiologic bases of a well balanced diet. On the smaller vessels there is often no settled ration and the men eat to suit their taste. Under these conditions it was found that they did not take over 2800 cal. and were satisfied with 90 to 96 g. of protein. The soldiers and sailors in general have gained from 3 to 5 kg. in wt. since the war opened. The present ration allows some liberty of choice, and consists of 130.5 g. protein. 45 of fats and 535.5 carbohydrates. This provides 3149 gross cal., or including the wine ration 4329 cal. The more vegetable and fruit diet of the Italians in peace times should not be regarded as a token of inferiority but the reverse. Quoting Alfieri, "The plant man thrives better in Italy than elsewhere." L. W. RIGGS.

**Some nutritive properties of corn.** J. S. HUGHES. *Kansas Agr. Expt. Sta., Tech. Bull.* 5, 39(1918).—Expts. were conducted on the feeding of corn to pigeons, squirrels and chickens. Corn is shown to contain relatively large quantities of anti-neuritic substances, similar to those found in rice polishings. The corn germ did not prevent polyneuritis. J. J. SKINNER.

**Is vitamine identical with secretin?** B. C. P. JANSEN. *Geneesk. Tijdschr. voor Ned. Indië* 58, 191-7; *Chem. Weekblad* 15, 1520-1(1918).—Various statements occur in the literature about the identity of secretin with vitamine. Expts. showed that the vitamine from rice hulls is not identical with secretin. If it were, the fact could be used as the basis for a quant. method of detg. vitamine. An incidental result of the expts. was the observation that *K salts injected into the blood vessels are poisonous.*

JULIAN F. SMITH.

#### ABNORMAL.

**Action of beri-beri serum upon the heart of the frog.** G. KANEKO. *Chugai Iji Shimpo* 895, 807-11(1917); *Jap. Med. Literature* 3, 56(1918).—The serum and milk of nursing beri-beri patients usually, though not invariably, contain a toxin which contracts the heart of a frog. JOSEPH S. HEPBURN.

**Examination of the cerebrospinal fluid in beri-beri.** H. IIDA. *Chugai Iji Shimpo* 895, 812-5(1917); *Jap. Med. Literature* 3, 56(1918).—In certain cases of beri-beri the pressure of the cerebrospinal fluid was greatly increased, especially during the acute stage; the pressure was as low as 100 mm. in slight cases, and as high as 180 to 280 mm. in certain cases; the blood pressure remained low. Cerebrospinal fluid, which exerted a high pressure, was drawn from the patient and was perfused through a rabbit ear; it was found to possess a powerful vasoconstrictor action. JOS. S. HEPBURN.

**Diet in hypertension.** GEORGE CARROLL SMITH. *J. Am. Inst. Homeopathy* 11, 645-54(1918).—A discussion of the diet in cases of high blood pressure of the benign or presclerotic type, the cardioarterial type, and the type due to interstitial nephritis. Attention is paid to the relation between carbohydrate, fat, and protein in the ration, its content of Fe and of acid-forming and base-forming elements. JOS. S. HEPBURN.

**Metabolism in a case of hemochromatosis.** C. W. McCLURE. *Boston. Arch. Intern. Med.* 22, 610-16(1918).—There was a retention of iron. The respiratory quotient and basal metabolism were normal. There was no gross disturbance in the intermediary metabolism. F. HULTON-FRANKEL.

The excretion of creatine, creatinine and uric acid in acute febrile conditions. C. W. McCLURE. Bethlehem, Pa. *Arch. Intern. Med.* 22, 719-49(1918).—The end products of protein metabolism, creatine, creatinine and uric acid, were studied on patients suffering from typhoid fever who were on a "Schaffer-Coleman" diet at the time of the expt. This diet is rich in fat and carbohydrate. The finding showed that there is no const. relation between the presence of pyrexia and creatinuria. Creatinuria, while usually occurring coincidentally with loss in body wt., is not definitely related to either the rapidity or the amt. of wt. loss. During the period of pyrexia creatinuria may occur unaccompanied by disturbances in the excretion of uric acid, and of creatinine. An increase in the output of creatinine is not always related to a loss in body wt. An increase in the output of uric acid during the course of an infectious disease is not wholly dependent on the presence of pyrexia. No definite relationship is found between the severity of the symptoms manifested by the patients and the amts. of creatine, creatinine and uric acid found in the urine. The disturbances in the excretion of creatine, creatinine and uric acid in fever are expressions of the effects of toxins in metabolism, and these continue during the period of convalescence. The loss of uric acid, creatine and creatinine is retarded by high-caloric diets rich in carbohydrates.

F. HULTON-FRANKEL.

The comparative food value of protein, fats and alcohol in diabetes mellitus, as measured by nitrogen equilibrium. HERMAN O. MOSENTHAL AND GEORGE A. HARROP. Baltimore. *Arch. Intern. Med.* 22, 750-758(1918).—The aim of the investigation was to det. the comparative values of protein, fats and EtOH as N spacers when added to a carbohydrate-free diet, in diabetes mellitus. The patients were given diets of a const. protein, fat and starch content, and of such caloric value that there was a negative N balance. This was the control period. Different amts. of protein, fat and EtOH were added to the diet and effects on the N balance studied. The results showed that the addition of an equal number of calories of protein, fat or EtOH to a low caloric carbohydrate-free diet, results in the assimilation of considerable amts. of N when the protein is used, a favorable N balance in only occasional instances with fat, and no change in N equil. with EtOH. This would point to a high-protein diet as the most advisable low-calorie diet, free of carbohydrate, by which to conserve the body tissues and furnish a maintenance ration for diabetics.

F. HULTON-FRANKEL.

Content of ketone and ketogenic products in the urine of patients with traumatic shock. RENÉ FABRE AND RENÉ CLOGNE. *Compt. rend. soc. biol.* 81, 884-6(1918).—"Ketone substances" (preformed  $\text{Me}_2\text{CO}$  and acetoacetic acid) were detd. by acidifying urine with  $\text{H}_2\text{SO}_4$  and distg.; "ketogenic substances" ( $\beta$ -hydroxybutyric acid, etc.) were detd. by treating the residue from the 1st distn. with  $\text{K}_2\text{Cr}_2\text{O}_7$  and again distg.  $\text{Me}_2\text{CO}$  in both cases was detd. by producing  $\text{CHI}_3$  in the alk. distillates by addition of a 0.1 N I soln. and titrating the excess of I with  $\text{Na}_2\text{S}_2\text{O}_3$  soln. The contents of  $\text{Me}_2\text{CO}$  from "ketone" and "ketogenic" substances in the urine of normal individuals was 0.003-0.005 g. and 0.011-0.018 g. per l., resp. These contents were only slightly greater with slightly fatigued patients (soldiers) than with normal individuals. The contents of  $\text{Me}_2\text{CO}$  from "ketone" and "ketogenic" substances in the case of patients with traumatic shock were 0.021-0.044 g. and 0.044-0.175 g. per l., resp.; in the case of patients with gaseous gangrene these contents were 0.015-0.039 g. and 0.054-0.125 g. per l., resp. These values cannot be attributed to fatigue, fast or effect of anesthesia, since seriously wounded patients under the same conditions showed practically normal values.

H. S. PAINE.

Metabolism of the organism in a state of shock and observations on the peculiar sensitiveness of shocked subjects to anesthetics. W. MESTREZAT. *Compt. rend. soc. biol.* 81, 888-91(1918).—The peculiar sensitiveness of shocked subjects to anes-

thetics was shown by a remarkable rise in the formol index curve ( $\text{NH}_3$  + amino acids expressed as  $\text{NH}_3$ ) when anesthetics were administered. Metabolism was greatly disturbed by shock, this being shown by the abundant presence in the urine of N, C and H compds. which are not normally present or which are present in much smaller proportions. The ratio to urea of residue at  $100^\circ$ —(ash + urea) was much greater than the physiol. value. The coeff. of acidosis was considerably greater than normal.

H. S. PAINE.

**Intoxication from war wounds; nitrogen retention by the wounded.** P. DUVAL AND A. GRIGAUT. *Compt. rend. soc. biol.* 81, 873-81(1918).—Observations of wounded soldiers showed an increase in non-protein N compds. and residual N of the blood which was parallel to a decrease in the non-protein N of the traumatized tissue; this increase was proportional to the intensity of the phenomena of intoxication. The av. normal values for content of total non-protein N in the plasma, whole blood and corpuscles were 23, 32 and 48 cg. per 1000 g., resp. The av. normal values for content of residual N (subtracting the urea N content from the above) in the plasma, whole blood and corpuscles were 10, 20 and 32 cg. per 1000 g. Both total non-protein and residual N were, as a rule, increased (not greatly in most cases) in the wounded. This increase commenced immediately after the wounding, passed through a max. on the 2nd day and decreased progressively to normal with convalescence. Regardless of the intensity of additional causative factors such as infection, jaundice and anesthesia the increase in non-protein N of the blood rarely resulted, in most cases, in values reaching twice the normal. On the contrary, values greater than twice the normal were usually encountered in the plasma of wounded in a state of shock. This increase affected the corpuscles as well as the plasma. The latter was first affected, however, and the changes in its non-protein N curve always preceded those of the similar curve for the corpuscles. In cases of recovery the total non-protein and residual N decreased progressively to normal; in case of death the increase was const. and regular until death ensued. In 1 instance the blood 5 hrs. before death contained 0.673 g. residual N and 0.347 g. urea N per 1000 g. This increase in the non-protein N of the blood during shock resembles the azotemia of Bright's disease with the exception that the latter is a case of retention of urea, while N retention during shock is a case of retention of residual N. In the case of shock the residual N value varied practically proportionally to N retention. While increase in residual N is due to alteration in the hepatic cells, hepatic insufficiency is not the primary cause. Retention is primarily due to the influence of the sudden afflux to the liver of the N reserve of the tissues which is liberated by the traumatism. W. Mestrezat, commenting on the above, directed attention to the relation during shock of an unusually high content of undetd. N in the urine (cf. preceding abstr.) and the increase in residual N in the plasma as indicated above.

H. S. PAINE.

#### F. PHYSIOLOGY.

ANDREW HUNTER.

**The pigmentation of nerve cells. I. The non-fatty melanotic pigment in the dog and rabbit produced by chronic depression.** D. H. DOLLEY AND FRANCES V. GUTHRIE. Univ. Missouri. *J. Med. Res.* 39, 123-42(1918).—Pigment is not a natural constituent of the cells of any region of the central nervous system or of the Gasserian, spinal, vagus and superior cervical ganglia of the rabbit and dog. A melanotic pigment is produced by functional depression of some duration in any or all cells in these animals. Under no conditions does a fat-holding pigment occur in these cells. GEO. T. CALDWELL.

**Action of chicken serum upon the blood-vessels.** M. TOTO. *Chugai Iji Shimpō* 897, 947(1917); *Jap. Med. Literature* 3, 57(1918).—Blood serum from normal chickens was dild. with Ringer soln. and injected into the leg of a frog; it caused a

pronounced contraction; the degree of contraction was in direct proportion to the concn. of the serum. This vasoconstricting property was not destroyed by heating the serum at 60° for 1 hr., but was weakened or removed by keeping the serum in an ice-box for 1 to 2 days. Vasoconstriction was not produced when the serum was applied directly to the exposed mesentery of a frog or rabbit. Serum from chickens, which were affected with rice disease—a form of beri-beri—produced vasoconstriction even more decidedly than did that from normal birds.

JOSEPH S. HEPBURN.

Oxygen capacity of blood combined with lung extract. A contribution to the study of the gas exchange in the lung. M. HASHGAWA. *Tokyo Igakukai Zasshi* 31, No. 12, 1-12(1917); *Jap. Med. Literature* 3, 59(1918).—Lung tissue was thoroughly cleansed, then extd. with Ringer soln. Blood was treated with CO<sub>2</sub> and with H, then mixed with the ext. The mixt. was enclosed in a separatory funnel for 30 min., and the O content of the blood then detd. For a control, the same blood was mixed with Ringer soln. The exptl. blood proper never contained more O than the control. Therefore participation of an enzyme in the mechanism of the gas exchange in the lung is apparently excluded.

JOSEPH S. HEPBURN.

Power of the lens of the eye to neutralize alkaline solutions. R. HAYANO. *Tokyo Igakukai Zasshi* 31, No. 21, 1-35(1917); *Jap. Med. Literature* 3, 60(1918).—In the eye of normal animals, including cattle, dog, guinea pig, goat, cat, and man, the lens possesses the power to neutralize alk. solns. The power depends on the size of the lens, is not specific for any animal, is less in old animals than in young ones, and has disappeared in eyes that have been removed for a considerable period of time, or have been taken from dead bodies. A soln. prepd. from the lens has this property; a concd. emulsion of the lens combines with relatively more alkali than is neutralized by a more dil. emulsion of the same amt. of lens. The more concd. the alkali soln., the greater is the amt. of lens substances with which it combines. Higher temps. apparently decrease the combining power; however, the power is not readily lost by a soln. kept at a const. temp. The peripheral portion of the lens is more anti-alk. than the central portion. The neutralizing power is below normal in a lens affected by cataract. The power to neutralize alkali is ascribed to Krystallin A and B, and not to the albumin and albuminoids of the capsule.

JOSEPH S. HEPBURN.

Heat hemolysis and its relation to blood serum. Y. KUNO. *Tokyo Igakukai Zasshi* 32, No. 2, 1-36(1918); *Jap. Med. Literature* 3, 77(1918).—Mixts. of serum and a suspension of erythrocytes were kept at various temps., and the time at which hemolysis occurred was compared with a control. The power to inhibit hemolysis was greater in fresh serum than in older samples. Inhibition was obtained with serum diluted 1:20,000 and reached its max. with serum diluted 1:50. No difference was observed between homologous and heterologous series, even when the species were far apart. The inhibitory power was completely destroyed by inactivation of the serum for 30 min. at 50°.

JOSEPH S. HEPBURN.

Remarks on the concentration of urea in normal blood. LUDWIG KAST AND EDNA L. WARDELL. New York. *Arch. Intern. Med.* 22, 581-92(1918).—Of 244 cases studied 84%, with not more than 20 mg. of urea N per 100 cc., showed no symptoms of kidney lesion or very slight symptoms. Those individuals with more than 20 mg. showed symptoms of renal function impairment. It is concluded that 20 mg. of urea N per 100 cc. of blood may safely be taken as the upper limit for the normal and that the detn. of urea N is a safe index of renal function.

F. HULTON-FRANKEL.

The effect of thymus gland injections on the growth and behavior of guinea pigs. D. M. OLKON. Chicago. *Arch. Intern. Med.* 22, 815-29(1918).—The injection of thymus gland intraperitoneally into male guinea pigs caused a reduction in wt. There

were muscular spasms, dyspnea and convulsions, spasms being greater than those caused by the injection of muscle or NaCl. Large doses killed some of the animals. The appearance of the animals was that of grave metabolic disturbances, emaciation, dryness and roughness of hair. F. HULTON-FRANKEL.

**Studies in the functional estimation of stomach contents. III. Effects of hydrochloric acid therapy on the acid titer of the stomach during digestion.** BURRILL B. CROHN. *Am. J. Med. Sci.* 156, 656-65(1918).—Small doses of HCl at frequent intervals are advised. No stimulation of the mucosa was observed. W. MORSE.

**Lactic acid in the gastric contents.** L. PRON. *Compt. rend. soc. biol.* 81, 468-9 (1918).—Examn. of a large no. of gastric contents free from alimentary debris (during fast) showed a considerable preponderance of positive Uffelmann reactions when free HCl was present and a practically equal no. of positive and negative results when free HCl was absent. Somewhat similar results were obtained with a smaller no. of gastric contents examd. after an Ewald test meal. In a no. of cases of alimentary retention through stenosis of the pylorus lactic acid was detected less frequently than in the above instances with normal pylorus, the reaction being negative in the majority of cases with free HCl and positive in the majority of the very small no. of cases without free HCl. These results confirm P.'s previous observation (regarded as doubtful in view of the results of Gérard and Regnault—cf. C. A. 13, 458) that lactic acid is of extremely frequent occurrence in the gastric contents and especially in the free HCl gastric content of fast. The positive Uffelmann reactions cannot be attributed to the use of glycerol (as pointed out by G. and R.) employed for moistening the tube used for withdrawal of gastric contents, since no glycerol was used in the present cases. Contrary to the view of Timbal and others the presence or absence of lactic acid in the free HCl gastric contents of fast has no significance so far as occurrence of ulcer is concerned. The following slight modification of the technic of the Uffelmann reaction is recommended. Instead of pouring several cc. of gastric liquid into the mixt. of  $H_2O$ ,  $Fe_2Cl_6$  and  $PhOH$ , allow a small portion of gastric liquid to flow on the surface of the reagent and observe the color produced as the liquid slowly drops to the bottom of the test tube. When the reaction is positive a characteristic reddish fawn-colored train is produced; when the color is yellow the reaction is regarded as doubtful. H. S. PAINE.

**Studies of the osmotic-chemical equilibrium between the liquid of blood corpuscles and the serum. I.** H. J. HAMBURGER. *Arch. néerl. de physiol.* 2, 636-43; *Chem. Weekblad* 15, 1360(1918).—The liquid obtained by pressing red corpuscles through infusorial earth and that obtained by the freezing out method both have a lower osmotic pressure than that of the serum. The ultrafiltrate from the pressed-out liquid has a still lower osmotic pressure. This is attributed to absorption of electrolytes from the stroma. These are preliminary expts. in a study of the question whether or not K predominates in the red corpuscles and Na in the serum. JULIAN F. SMITH.

**The influence of calcium salts on the processes of phagocytosis.** J. DE HAAN. *Arch. néerl. de physiol.* 2, 674-84; *Chem. Weekblad* 15, 1361(1918).—To find whether the influence of Ca salts on phagocytosis in the horse is similarly exerted on the leucocytes of other animals the rabbit was studied. The influence of Ca salts was found to be analogous in both cases. JULIAN F. SMITH.

#### G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**Studies on the antitypsin of serum.** B. FUGIMOTO. *J. Immunology* 3, 51-66 (1918).—The temps. that must be applied for the inactivation of antitypsin of serums differ not according to individuality but according to species and lie between 65°

and 75°. As serums never coagulate at 75° in their lower concn., it is better at first to dil. them and then heat at 75° for 10-30 mins. for their complete inactivation. The antitryptic action of urine cannot be affected as easily as that of serums. Urine must be heated at 100° for one hour for its complete inactivation. The antitrypsin of serum cannot be inactivated by shaking and it is not dialyzable. Both the globulin and albumin fractions of serum are antitryptic, but the former is less so than the latter. The ether ext. of serum has no antitryptic action but cryst. serum albumin is antitryptic.

GEO. T. CALDWELL.

**The immunologic properties of uveal pigment.** A. C. WOODS. *J. Immunology* 3, 75-91(1918).—The pigment of the uveal tract of the eye acts as antigen in homologous animals and in the immunologic reactions in organ but not species specificity. These findings can be demonstrated by the complement fixation reaction with the sera of properly immunized animals. In the case of the perfusion expts., the anaphylactic reaction is manifested by a marked contraction of the pupil, and the occurrence of small hemorrhages in the fundus. This reaction was used to study the antigenic properties of uveal pigment, and the results shown by complement fixation were confirmed.

GEO. T. CALDWELL.

**Experiments upon the passive transfer of antibodies from the blood to the cerebrospinal fluid.** J. A. KOLMER AND S. SEKIGUCHI. *Univ. Pa. J. Immunology* 3, 101-7 (1918).—The removal of blood from normal dogs followed by the intravenous injection of human syphilitic serum in amts. varying from 30 to 50 cc. per kg. of body wt. was followed by the presence of small amts. of syphilis reagin (the antibody concerned in the Wassermann reaction) in the cerebrospinal fluid. This appeared as early as 3 hrs. after transfusion with syphilitic serum and apparently disappeared after 22-4 hrs. as detd. by completely negative Wassermann reactions. After irrigation of the spinal meninges by the preliminary injection of sterile horse serum the amt. of reagin gaining access to the cerebrospinal fluid after transfusion appeared to be somewhat greater. The intravenous injection of dog typhoid immune serum into a normal dog in amt. of about 30 cc. per kg. of body wt. was followed by the appearance of traces of agglutinin in the cerebrospinal fluid within 3 hrs. after transfusion; fluid removed 48 hrs. later was free from agglutinin.

GEO. T. CALDWELL.

**A new method of estimating the antitryptic index of blood serum.** T. B. ROBERTSON AND S. HANSON. *Univ. Calif. J. Immunology* 3, 131-8(1918).—It is shown that for varying proportions of an antitrypsin ( $A$ ) added to a specified amt. of trypsin (regarded as unity) the relation  $T/[A(I - T)] = C$  holds good for any given serum,  $T$  being the proportion of the trypsin neutralized by the serum and  $C$  a const. which is a direct measure of the number of mols. of antitrypsin contained in a specified vol. of serum. The mol. concn. of antitrypsin in blood serum is in great excess of the mol. concn. of proteolytically active material in a 1% soln. of Gruebler's trypsin.

GEO. T. CALDWELL.

**The non-influence of injections of trypsin upon the protein quotient in blood serum.** S. HANSON. *Univ. Calif. J. Immunology* 3, 139-46(1918).—The normal variation in the antitryptic index is very marked in any particular rabbit, and is even greater in different animals. The progress of immune body production against trypsin is very peculiar in that at first there is a marked fall in the antitrypsin, followed soon, however, by rather a sudden rise which is at best only 300% above the normal variation. At this level the antibody content remains approx. stationary for a comparatively brief period and then rapidly returns to normal, in spite of continued periodical injections of trypsin. Immunity to pancreas trypsin appears to cause no change in the protein quotient. This fact may serve as additional evidence in favor of the recently

emphasized view that immunity is non-dependent on the concn. of the serum proteins.

GEO. T. CALDWELL.

A study of the immunizing properties of bacterial vaccines prepared after various methods. M. W. PERRY AND JOHN A. KOLMER. *J. Immunology* 3, 247-59(1918).—All vaccines of *B. typhosus* prepd. in various ways and including living, autolyze, chem. and heat-killed and alc.-killed sediment usually produced slight leucocytosis and slight increase of temp. when administered to rabbits by subcutaneous injection in doses according to body wt. and comparable to those given to persons. The alc.-killed sensitized sediment produced these non-sp. reactions in highest degree. Agglutinin and complement-fixing antibodies were produced in highest degree by administration of living and autolyzed vaccine. An antigen of *B. typhosus* prepd. by cultivating the organism in plain neutral broth for 48 hrs. and sterilizing the culture with 0.1 % of commercial formalin (40%) in a cold dark place for a period of 4-5 days, proved of particular value in macroscopic agglutination tests.

GEO. T. CALDWELL.

Complement fixation with protein substances. R. L. KAHN AND A. MCNEIL. *J. Immunology* 3, 277-93(1918).—Gelatin, racemized proteins, proteoses, Vaughan's sol. poison from casein, insol. residue remaining from the prepn. of Vaughan's poison from casein and animal tissues, did not produce complement-fixing antibodies when injected into rabbits. What has been found to be true in the case of other immunity reactions, appears to be true, also, in the case of the complement-fixation reaction, namely, that the specificity of the complement-fixation reaction depends upon the chem. structure of the protein mol. and if the mol. be split or modified by racemization, its sp. complement-binding power is lost.

GEO. T. CALDWELL.

A contribution to the study of the complement fixation reaction in tuberculosis. M. A. WILSON. New York. *J. Immunology* 3, 345-50(1918).—Not all guinea-pig serums are efficient for tuberculosis complement fixation. The serum from each guinea pig should be tested for fixability with tuberculous antigen plus tuberculosis serum before pooling the complement for diagnostic tests.

GEO. T. CALDWELL.

A contribution to the study of the complement-fixation reaction for tuberculosis. H. VON WEDEL. New York. *J. Immunology* 3, 351-69(1918).—Pooled complement from at least six guinea pigs should be used in making the tests, as the complement from single pigs should be tested for its complement-fixation value with known positive serums. Double the original Wassermann amt. of patient's serum should be used and no report should be made until the serum has been tested after having been kept under sterile conditions in the ice chest for from 4 to 6 days, preferably 6 days. These results seem to indicate that if these modifications are used, 100% of non-tuberculous cases will give abs. negative results; nearly 100% of the primary and active cases will give positive results with the exception of the dying cases; and about 35% of the partially inactive and inactive cases will give only weak positive results.

GEO. T. CALDWELL.

The role of immunity in the conduct of the present war. J. A. KOLMER. Phila. *J. Immunology* 3, 371-4(1918).—An address.

GEO. T. CALDWELL.

The mode of action *in vitro* of the preparation of hemolytic antibodies. A. K. BALLS AND J. W. KARNS. New York. *J. Immunology* 3, 375-87(1918).—The work was undertaken with the idea of studying the mechanism of amboceptor action *in vitro* and of ascertaining, if possible, what part of the red blood cells is responsible for their antigenic property. *In vitro*, as hemolysis proceeds, the total amt. of amboceptor is const. As the stroma of the laked red blood cells increases in amt. the latter become less and less satd. with amboceptor and so split off less of it by dissociation, thus causing the velocity of hemolysis to decrease. *In vivo*, the stroma produces sp. hemolytic and agglutinative bodies of high titer. Alc. and ether exts. of the stroma do not bind amboceptor *in vitro*.



The ext. of stroma with alk. physiol. salt soln. (0.2% NaOH) does bind amboceptor *in vitro* and on injection causes the development of sp. hemolysins but not of agglutinins. This alk. ext. contains nucleoprotein, but not simple albumin or globulin. It also contains lipoids but these probably are not essential to its antigenic function. The presence or absence of the anaphylactic reaction is not a certain criterion for specificity when nucleoproteins are used as antigens. Hemolysins, showing species specificity, were present in the absence of anaphylaxis. GEO. T. CALDWELL.

Studies in pneumonia. VIII. A skin reaction to pneumotoxin. C. WEISS AND J. A. KOLMER. *J. Immunology* 3, 395-411 (1918).—See C. A. 12, 2619. G. T. C.

A method of preparing bacterial antigens. J. C. SMALL. *J. Immunology* 3, 413-22 (1918).—The efficiency of a bacterial antigen is raised by the removal of the  $\text{CHCl}_3\text{-Et}_2\text{O}$ -sol. constituents of the dried bacteria. Standardized dry antigen preps. can be made and rendered available for work over long periods. The complement deviation reaction has limited uses in the differentiation of type within the bacterial groups studied. The failure to differentiate type is more pronounced in the pneumococcus and in the meningococcus groups. In the typhoid group the striking thing is the degree of complement deviation by the typhoid antigen in cross titration with the paratyphoid bacilli A and B serums. Paratyphoid B is less efficient than paratyphoid A in fixing complement with typhoid immune serum. In the dysentery group the results rather sharply differentiate the Shiga from the Flexner and "Y" types.

GEO. T. CALDWELL.

A study of saponin hemolysis. T. FURUHATA. Tokyo. *J. Immunology* 3, 423-34 (1918).—The hemolytic action of saponin or sapotoxin is, to a certain extent, inhibited in a non-electrolyte medium. As nonelectrolyte media isotonic solns. of glucose and of sucrose were employed. As the viscosity of the medium increases there is an increased inhibition of the hemolysis by saponin. Ions of various salts favor saponin hemolysis, except  $(\text{NH}_4)_2\text{SO}_4$  which can alter the red cells in higher concn.  $\text{BaCl}_2$  and  $\text{CaCl}_2$  are indifferent. The resistance of red blood cells against saponin is different in the different species of animals, the order of increasing resistance being horse, guinea pig, rabbit, pig, sheep and pigeon among the red blood cells tested against jegosaponin.

GEO. T. CALDWELL.

Specific fats as factors in immune processes. C. C. WARDEN. Univ. Mich. *J. Infec. Dis.* 23, 504-21 (1918); cf. C. A. 12, 1483.—The fat complexes of certain bacteria (typhoid, gonococcus, and pneumococcus) and other cells (red blood cells of sheep blood), obtained either from the cells or assembled artificially, are capable of replacing the cells themselves in the production of sp. antibodies in the blood of rabbits injected with them. The specificity of the antibodies obtained by the injection of cells probably depends in part or wholly on the configuration of the fats constituting the bulk of the cell surfaces.

JULIAN H. LEWIS.

Studies on cholesterol. V. The blood cholesterol in malignant disease and the effect of radium on the blood cholesterol. GEORGINE LUDEN. Rochester, Minn. *J. Lab. Clin. Med.* 4, 849-62 (1918).—See C. A. 13, 37. GEO. T. CALDWELL.

Immunity in tissue transplantation. IV. The influence of immune serum upon the reactions about transplanted tissues. M. S. FLEISHER. St. Louis. *J. Med. Res.* 39, 1-14 (1918); cf. C. A. 12, 2365.—In passively immunized animals the same reactions occur about homoiotransplants as in normal animals. About heterotransplants there is possibly a slower clearing of the peripheral portion of the tissue of leucocytes but otherwise the reactions are like those in normal animals. G. T. CALDWELL.

Studies in pneumonia. IX. The properties of pneumotoxin and its probable function in the pathology of lobar pneumonia. C. WEISS. Phila. *J. Med. Res.*

39, 103-22(1918).—Living virulent washed pneumococci when dissolved in dil. soln. of sodium choleate liberate an endocellular hemolytic toxin (pneumotoxin). Different preps. of pneumotoxin vary considerably in their toxicity. Sp. pneumococcal substances such as anti-pneumococcus horse serum or solns. of various cinchona derivs. will not neutralize the toxicity of pneumotoxin either *in vivo* or *in vitro*. This substance is very labile, much or all of its activity being lost upon aging, Berkefeld filtration or heating. It is a true protein giving all the color reactions, being digested by trypsin, serving as an antigen, producing an antihemolytic serum, and a state of allergy in sensitized guinea pigs. It produces a sp. precipitin reaction with the corresponding type anti-pneumococcus horse serum. It is present in pneumonic lung exudates and is demonstrable by means of a skin test in acute lobar pneumonia patients. Hemoptysis and icterus in pneumonia are regarded as partly or entirely the result of that hemolytic activity of pneumotoxin. GEO. T. CALDWELL.

**The standardization of the Wassermann reaction.** W. D'ESTE EMERY. *Lancet* 1918, II, 547-52.—By extg. sheep's heart with abs. alc. for 7 to 10 days an antigen can be prepd. which is almost abs. const. In actual practice three exts. prepd. from three different hearts are kept separate and later mixed and cholesterol is added before using. Syphilitic sera prepd. aseptically and free from foreign materials remain const. for at least a month and probably longer, at room temp. The use of such sera affords an easy means by which an experimenter can obtain comparable results. Accurate standardization of such sera will enable workers by any technic to obtain comparable results. GEO. T. CALDWELL.

**The agglutinating properties of certain sera against *B. typhosus*, *B. paratyphosus* A and B.** T. T. O'FARRELL. Dublin. *Lancet* 1918, II, 626-7.—The results obtained with 496 sera of inoculated men show that the number of sera which fail to agglutinate *B. typhosus* increases as the time following the last inoculation is prolonged. There is a sudden increase in the number of negative sera at the end of 15 months. In so far as agglutinins can be taken as an index of immunity against infection, the immunity is high for the first 3 months after inoculation, moderate from 4 to 15 months and low thereafter. The typhoid agglutinin content is higher in mixed vaccine cases, at practically all periods, than in cases inoculated with typhoid vaccine alone. G. T. C.

**The use of "antigens" in diagnosis by the Wassermann reaction; the necessity for further investigation.** C. W. BROWNING AND E. L. KENNEWAY. *Lancet* 1918, II, 733-5.—In the absence of an ideal antigen a proportion of weak positive reactions will be missed if only a single antigen be used in performing the Wassermann test. It is advised that parallel tests be made with heart cholesterol and liver lecithin plus cholesterol antigens. Where tests were performed with only one antigen, all sera should be preserved so that if a positive reaction fails to be obtained in cases which are clinically suspicious, the test may be repeated with the other antigen. GEO. T. CALDWELL.

**Postdiphtheritic paralysis and the spinal fluid findings.** JOSEPH C. REGAN. Kingston Ave. Hospital for Contagious Diseases, New York City. *Arch. Pediatrics* 35, 641-5(1918).—In 6 cases (including 4 fatal cases) of this disease, the findings were normal in all instances, except a slight increase in the albumin and globulin content of the fluid in 1 patient. The cell count never exceeded 7 per mm.<sup>3</sup>; lymphocytes predominated. Reduction of Fehling soln. was normal. The fluid was clear, transparent, and usually under a slight hypertension. "The spinal fluids were taken at various stages in the disease from a period shortly after paralysis developed in some cases, until just preceding or following death in others. It seemed rather doubtful, therefore, that a transient meningeal reaction could exist and yet leave no trace at the diverse periods of the disease in which punctures were performed. All the patients

in the series were suffering from a grave and usually mortal type of paralysis, a type in which central involvement of the nervous system could be most expected."

JOSEPH S. HEPBURN.

**Epidemic of dengue among soldiers in Formosa.** S. HANABUSA. *Gunidan Zasshi* 70, 578-94(1917); *Jap. Med. Literature* 3, 72(1918).—In 88 cases of dengue, the diazo reaction of the urine was positive in 81.2%; the positive reaction was closely connected with the appearance of the exanthem, reached its acme at the same time as, and disappeared with, the latter. Albumin occurred in the urine of 8.3% of the cases.

JOSEPH S. HEPBURN.

**Calcium soap deposit in the liver during diabetes.** R. HAGIWARA. *Iji Shimbum* 981, 1201-2(1917); *Jap. Med. Literature* 3, 62(1918).—At the autopsy of a patient who had shown acetonuria, deposits of Ca soaps were found in the liver such as occur in fat necrosis as a result of pancreatic lesions. No lesion could be demonstrated in the latter organ, and no explanation could be found for the deposits. J. S. H.

**Experimental study of sera and placental extract in eclampsia.** I. OBATA. *Tokyo Igakukai Zasshi* 31, No. 19, 37-61(1917); *Jap. Med. Literature* 3, 74-5(1918).—The placental exts. of normal women apparently differ in no way from those of eclamptic women. Normal serum has a detoxicating action on placental ext.; this property is markedly decreased in the sera of eclamptic women, but is rapidly regained, as a rule, within 2 or 3 days after delivery. The decreased detoxicating action of the serum is a cause and not the result of eclamptic seizures. On injection of placental exts. into animals, the phenomena produced more or less resembled those of eclampsia. Gradual introduction of placental ext. (e. g., during a period of 12 days) produced far more profound pathological changes than a single, large dose: fatty changes in liver, kidneys, and heart; increased coagulability of the blood; parenchymatous bleeding; thrombus formation in liver and lungs; and more or less evidence of profound intoxication such as occurs in eclampsia. It is concluded that eclampsia is a temporary lowering of the power of the maternal serum to detoxicate placental ext. JOSEPH S. HEPBURN.

**Placental antigen in its relation to serum of pregnant women.** G. FUJIMURA AND T. HIROSE. *Tokyo Igakukai Zasshi* 31, No. 24, appendix, pp. 18(1917); *Jap. Med. Literature* 3, 76(1918).—The serum of pregnant women contains antibodies which bind complement in the presence of placental ext. These antibodies are rather closely specific for pregnancy, disappearing approx. 3 weeks from the time of delivery; they are distinct from the protective enzymes, and have no relation to any complicating disease. JOSEPH S. HEPBURN.

**Toxicity of immune serum.** Y. YAMADA. *Tokyo Igakukai Zasshi* 32, No. 1, 1-32(1918); *Jap. Med. Literature* 3, 76-7(1918).—Anti-goat dog serum was used for injection into guinea pigs. Goat cells which had been heated to 120° retained the power to produce a toxic and hemolytic serum. Intraperitoneal injection of the serum failed to produce demonstrable intravital dissolution of the guinea-pig corpuscles; it was immediately followed by intense symptoms, thereby differing from serum anaphylaxis; repeated intraperitoneal injection of sublethal doses of serum eventually produced immunity, and anaphylaxis was no longer possible. Anaphylatoxin could not be demonstrated in (a) blood of guinea pigs in the anaphylactoid state, or (b) a mixt. of goat-blood-immune dog serum, emulsion of guinea-pig organs, and complement. The titer of hemolytic action did not run parallel to the temp. curve obtained after injection of the serum. The toxicity of the serum was greatly influenced by the mode of its withdrawal, and by the period of time elapsing thereafter, and was quite resistant toward the action of acids and alkalies. The albumin fraction, and not the globulin, was toxic. Intraperitoneal injection of adrenaline inhibited the anaphyl-

actoid reaction to a certain extent. The anaphylactoid reaction had no relation to serum sickness, and was not a manifestation of true anaphylaxis. J. S. HEPBURN.

**Clinical study of hyperemesis gravidarum.** N. KUJI. *Tokyo Igakukai Zasshi* 32, No. 4, 1-49(1918); *Jap. Med. Literature* 3, 78(1918).—Observations were made on 17 patients. The temp., and positive albumin and diazo reactions in the urine have no prognostic value; a decrease in the vol. of the urine is not a measure of the severity of the disease. When an intravenous saline infusion is given, the vol. of the urine should increase, and its sp. gr. should *not* be persistently low; otherwise conditions are serious. In serious cases acetone and diacetic acid are usually present in the urine, and its  $\text{NH}_3$  content is increased. The % and amt. of total urinary N and the ratio total N:total S decrease; the S decreases in proportion to the severity of the disease, and increases with recovery. Inorganic S usually decreases, in severe cases, to less than half the total S; conjugate sulfates are not materially changed; neutral S definitely increases, in fulminant cases both absolutely and in comparison with the total figure; in severe cases it coincides more or less closely with the value for conjugate sulfates. Total P is always low; and its ratio to total N becomes less the more severe the condition. The PhOH figure usually is unchanged, but, as a rule shows a sudden and marked rise just before death. "These findings are not those of starvation, in which the intestinal putrefaction is in abeyance, but they signify rather a change in the process of oxidation in the body, and a disturbance in the function of the liver which in turn is doubtless the result of a toxic process." JOSEPH S. HEPBURN.

**Renal function as measured by the elimination of fluids, salts and nitrogen and specific gravity of the urine. II. The effect of high and low normal diets.** H. O. MOSENTHAL. Atlanta. *Arch. Intern. Med.* 22, 770-804(1918).—The expts. showed that certain characteristics as indicated by sp. gr. of all specimens and vol. of the night urine are preserved regardless of diet. There are periods of polyuria with low sp. gr. alternating with oliguria and high sp. gr. If only small amts. of water are taken the urine output is low, const. from one 2-hour period to the next and the sp. gr. becomes fixed at a high level. Tests on high- and low-protein diets were carried out on individuals suffering from impairment of the renal function. Nocturnal polyuria occurs more frequently on high- than on low-protein diet. There is apparently an effort to eliminate solids by means of polyuria, when the concn. of solids is no longer possible. Nocturnal polyuria on low-protein diet is a much graver sign of renal insufficiency than when it occurs on high-protein diet. When edema was present there were rapid changes from oliguria to polyuria. In such cases the clinical aspect of the case must be taken into consideration and not the elimination of the urine alone. F. HULTON-FRANKEL.

**The coagulation of the blood and anaphylactic shock.** HAROLD A. BULGER. Harvard Med. School, Boston. *J. Infect. Dis.* 23, 522-32(1918).—The changes in the coagulability of the blood during anaphylactic shock are due to changes in that stage of the coagulation process at which thrombin is formed through the interaction of prothrombin, Ca, thromboplastin and antithrombin(?). These changes are probably due to variations in thromboplastin. Antithrombin changes are not great. In some animals there may be an increase in antithrombin which would aid in retarding the coagulation of the blood. There is no increase in antithrombin in rabbits. There was a marked increase in the rate of fibrinolysis after anaphylactic and peptone shock.

JULIAN H. LEWIS.

**The Bartlett and O'Shansky modification of the Wassermann reaction.** E. H. REUDIGER. Bismarck, N. D. *J. Infect. Dis.* 23, 533-36(1918).—Compared with the regular method used by the author, the Bartlett and O'Shansky modification of the Wassermann reaction (*C. A.* 11, 3289; 12, 64, 383), designed to reduce the time used for the reaction, gives by far too many negative results.

JULIAN H. LEWIS.

**Failure to obtain potent serum from a horse injected with poliomyelitic material.** SAMUEL G. DIXON AND JAMES B. RUCKER, JR. *J. Infect. Dis.* 23, 543-6(1918).—Protective substances could not be demonstrated in the serum of a horse injected repeatedly over a period of 7 mos. with the unheated filtrate of a 1:50 emulsion of poliomyelitic brain and cord. JULIAN H. LEWIS.

**Studies in the metabolism of pathogenic *Actinomyces* (*Streptothrices*).** I. SELMAN A. WAXSMAN. Cutter Biol. Lab., Berkeley, Calif. *J. Infect. Dis.* 23, 547-54 (1918).—The purpose of these expts. is to find a bio-chem. basis of classification of the *Actinomyces*. The present report concerns only the pathogenic form. The observations made are: Blood agar is a very good medium for the growth of pathogenic *Actinomyces*, a good growth being obtained in 24-72 hrs. at 37°. The production of hemolysis on blood agar, the liquefaction of blood serum, the clotting and subsequent peptonization of the milk, the liquefaction of gelatin, run parallel; the organism that produces most hemolysis produces liquefaction of the blood serum and gelatin and a greater digestion of milk proteins; the organism that does not produce any hemolysis of the blood does not liquefy the blood serum and the gelatin, does not clot milk and has only a small action on the milk proteins. These characters can be used advantageously in the identification and classification of the *Actinomyces*. Some pathogenic. *Actinomyces* grow readily on synthetic mediums. JULIAN H. LEWIS.

**Immune reactions with diplococci isolated from measles and rubella.** RUTH TUNNICLIFF AND MARY WILMARTH BROWN. John McCormick Inst. for Infect. Dis., Chicago, Ill. *J. Infect. Dis.* 23, 572-7(1918).—Complement-fixing bodies for the diplococci isolated by Tunnicliff from measles and rubella are present in the blood of measles and rubella patients to a slight extent as the symptoms subside. The blood of rabbits injected with various strains of measles and rubella diplococci develops agglutinins and opsonins. Agglutinins are demonstrable in the blood of measles-immune rabbits often in high dilns., both with homologous and heterologous strains. Satisfactory agglutination expts. are not possible as a rule until long after isolation of the diplococcus on account of spontaneous agglutination. Agglutinins are present in the serum of immune rubella rabbits, but generally only for the homologous strains. Sp. opsonins are demonstrable in the blood of immune measles and rubella rabbits in high dilns., and furnish the easiest and most reliable immunological method so far found, to differentiate measles and rubella diplococci from each other and from other non-hemolytic diplococci and streptococci. JULIAN H. LEWIS.

**The toxicity of emetine hydrochloride, with special reference to the comparative toxicity of various market preparations.** GLEASON C. LAKE. Washington, D. C., U. S. Public Health Surv., Hyg. Lab., *Bull.* 113(1918).—The toxicity of emetine-HCl was studied in rabbits, white rats, and white mice, with the result that, with the same prepn. of the drug, a widely variable individual susceptibility was found in each of these species. Rowntree and Levy's work shows that the same holds true for cats and dogs. From the small amt. of data obtainable it seems probable that in man the range of susceptibility to emetine poisoning is fully as great as in exptl. animals, and perhaps more so, in so far as it has to do with cases of amebic dysentery, where there is always present a pathol. condition varying in intensity. The pathol. changes most often produced in exptl. animals are acute degenerative changes in the parenchymatous organs. Expts. carried on in a large no. of white mice failed to show any considerable variation in the toxicity of 12 market prepns., and make it highly probable that such apparent variations are largely attributable to the widely varying susceptibility of animals to the drugs. JULIAN H. LEWIS.

**Blood-pressure and kidney function findings in orthostatic albuminuria.** E. H.

MASON AND R. J. ERICKSON. *Am. J. Med. Sci.* 156, 643-656(1918).—Low pulse pressure is the cause of the albuminuria. W. MORSE.

**Sensitization and anaphylactic shock in guinea pigs by repeated injections of copper glycocholate.** A. CH. HOLLANDE. *Compt. rend. soc. biol.* 81, 58-61(1918).—Guinea pigs (300-500 g. wt.) died of anaphylactic shock after repeated intracardiac and intraperitoneal injections (1.5 cc. daily for a max. of 6 days) of a physiol. NaCl soln. containing 0.50 g. of Cu glycocholate per 100 cc. Some of the animals which received intracardiac injections died after the 3rd injection, while those which received intraperitoneal injections only showed anaphylactic shock after the 4th injection. Intracardiac or intraperitoneal injection of 7.5 mg. of Cu glycocholate produced no untoward results in unsensitized animals. It was possible to de-anaphylactize the anaphylactized animals by means of the Besredka method. In view of the fact that guinea pigs may be anaphylactized by Cu glycocholate and polypeptides such as diglycylglycine and triglycine (cf. expts. of Zung and Diakonov) composed of several mols. of glycine but not by glycoll itself, H. concludes that sensitization is probably a function of the  $\text{NH}_2$  group and that sensitization and particularly the production of anaphylactic shock may require the presence of at least 2  $\text{NH}_2$  groups in the compd. injected. At any rate, the chem. constitution of the peptide mol. plays an important role in establishing anaphylaxis. H. S. PAINÉ.

**Disappearance of the lipocholesterol deposits of the human suprarenal during motor activity.** M. LAIGNEL-LAVASTINE. *Compt. rend. soc. biol.* 81, 324-5(1918).—The suprarenals of patients with senile dementia, dementia praecox, maniacal excitation and pneumonia who died after at least 5 days of sustained and intense motor activity were characterized by total absence of lipocholesterol deposits in the cortex. Decrease of lipocholesterol content was not so pronounced in patients with the above affections but with less motor activity. These results have a bearing on the importance of the myotonic function of the suprarenals. Decrease in lipocholesterol content cannot, however, be attributed solely to sustained motor activity. H. S. PAINÉ.

**Effects of certain chemical reagents on the endotoxin and antigenic power of the Eberth bacillus.** L. BLAIZOT. *Compt. rend. soc. biol.* 81, 356-8(1918).—B. attempted to ascertain whether it is possible chemically to destroy the endotoxin of the typhoid bacillus without destroying its immunizing power. An 18-hr. culture of typhoid bacilli on gelose was washed with distd.  $\text{H}_2\text{O}$  and subjected in the presence of distd.  $\text{H}_2\text{O}$  to the action of the following reagents: (oxidizing agents) 1:100 chromic acid, 1:3  $\text{HNO}_3$ , 1:2  $\text{H}_2\text{O}_2$ ; (reducing agents) 1:10  $\text{HCHO}$ , 1:10 hydroquinone; (lipoid solvents) abs. alc., Na alcoholate (the 2 latter acted on bacteria free from  $\text{H}_2\text{O}$ ). Contact between bacteria and reagents was maintained 24 hrs. at  $37^\circ$ . All of the reagents reduced bacterial toxicity, but none of them entirely destroyed the endotoxin. The latter showed greater resistance to the oxidizing than to the reducing agents. The endotoxin showed considerable resistance to abs. alc. but was almost totally destroyed by Na alcoholate. This effect of alks. is also produced in an aq. medium as was shown by the action of 0.1 *N* NaOH. The injurious effect of the various reagents on the endotoxin was greater than that produced by heating at  $58^\circ$  for 20 mins., but less than that due to heating at  $120^\circ$  for the same period, no febrile reaction being produced in rabbits after injection of bacteria subjected to the latter treatment. The endotoxin of bacteria previously treated with  $\text{HCHO}$  was likewise thermolabile at  $120^\circ$ . Bacteria treated with  $\text{H}_2\text{O}_2$ ,  $\text{HNO}_3$ ,  $\text{HCHO}$  and hydroquinone and by heating at  $58^\circ$  and  $120^\circ$  immunized rabbits against amts. of living bacilli which killed the controls in 24 hrs. Bacteria treated successively with  $\text{HNO}_3$  and very dil. NaOH soln. and those treated with hydroquinone or heated at  $120^\circ$  were capable of producing immunity without causing the appearance of agglutinins. The agglutinating power of sera due

to injection of bacteria subjected to varying treatment was as follows: heating at  $58^{\circ}$ , 1:2,500-12,000;  $\text{HCHO}$ , 1:1000-5,000;  $\text{H}_2\text{O}_2$ , 1:2,500; chromic acid, 1:500-1000; abs. alc., *nil*; Na alcoholate, *nil*;  $\text{HCHO}$  followed by heating at  $120^{\circ}$ , *nil*. When the bacteria were treated with 1:3  $\text{HNO}_3$  and then centrifuged, washed with distd.  $\text{H}_2\text{O}$ , dild. to a definite vol. and then treated with dil.  $\text{NaOH}$  soln. added drop by drop a point was reached where the addition of another drop of  $\text{NaOH}$  soln. suddenly clarified the emulsion and produced the xanthoproteic reaction. After centrifuging, a clear soln. was obtained which was capable of immunizing rabbits without causing formation of agglutinins.  $\text{Me}_2\text{CO}$  pptd. from this soln. a yellow mass which carried with it the endotoxin and the immunizing property, the portion sol. in  $\text{Me}_2\text{CO}$  exhibiting neither toxic nor immunizing action.

H. S. PAINE.

**Antipepsin of the serum.** M. RUBINSTEIN. *Compt. rend. soc. biol.* 81, 511-2 (1918).—A normal serum (human, rabbit, guinea pig, cattle) dild. 1:10 with physiol.  $\text{NaCl}$  soln. and heated to  $100^{\circ}$  not only preserves its antipeptic action (as shown by Briot, Perin and Jochmann and Kantorowicz), but the inhibiting action also becomes more pronounced as the temp. increases. R. attributes this change to the fact that the serum after being heated neutralizes a portion of the free  $\text{HCl}$  which is requisite for the activity of the pepsin. Egg white, as well as blood serum, exhibits this antipeptic action; this anti-enzymic action of egg white is also intensified by heating. In so far as the antipepsin of immunization is concerned it is difficult to increase the antipeptic action of the serum in rabbits in spite of the presence in the serum of the immunized animals of antibodies detectable by the precipitin and fixation reactions (these antibodies may, on the whole, be regarded as directed against the impurities of com. pepsin). With the goose and chicken it is possible with difficulty to increase the antipeptic action of the serum (after long prepn.), but this artificial "antipepsin" as well as the normal "antipepsin" is intensified by heating to  $100^{\circ}$ . These results are to be considered in connection with Linossier's conclusion that the effect produced by heating to  $100^{\circ}$  is inconsistent with the hypothesis of the existence of a sp. antibody and that the inhibiting effect is due to the mutual reaction of the colloids of the serum and digestive liquid.

H. S. PAINE.

**Thermolability of syphilitic antibodies.** P. GÉRARD. *Compt. rend. soc. biol.* 81, 835-7 (1918).—Syphilitic antibodies are thermolabile in varying degree when heated at  $56^{\circ}$ . In some cases the capacity for fixing complement was reduced about  $\frac{1}{4}$ , while in other cases it was reduced as much as  $\frac{3}{4}$ . The beginning of this degradation was distinctly observed at  $45^{\circ}$  and often reached a value of 50% after heating  $\frac{1}{2}$  hr. The same degree of degradation was obtained after 24-48 hrs. at  $37^{\circ}$ . It was not detd. whether the varying degree of thermolability of syphilitic antibodies corresponded to definite periods of the disease. This thermolability is also shown by other antibodies, especially the natural human anti-sheep hemolysins; anti-sheep hemolysins produced by injection of erythrocytes in rabbits are much less sensitive. It is advisable, in performing the Wassermann reaction, to det. the maxima of fixation and to differentiate with respect to injection between various reactions which have been simply recorded as (+++). The reactions obtained with heated and unheated sera should be compared. In order to avoid as far as possible the destruction of antibodies the period of heating at  $56^{\circ}$  for destruction of complement should be reduced from  $\frac{1}{2}$  hr. to  $\frac{1}{4}$  hr.; the latter period is ample.

H. S. PAINE.

**Anergy in influenza.** ROBERT DEBRÉ. *Compt. rend. soc. biol.* 81, 913-4 (1918).—Expts. with 100 influenza patients showed a condition of anergy to exist in 72 cases, as compared with its occurrence in 90% of cases of measles (Netter and Porak); this was shown by using another antigen, *i. e.*, smallpox vaccine. The frequent occurrence and serious character of the secondary infections of influenza are probably due to this

condition and the relative inefficacy of antipneumococcic and anti-streptococcic sera, even when used in large doses, may likewise be due in part to the same condition. The biological resemblance between influenza and measles may possibly be associated with an etiological resemblance; the unknown agent of influenza is probably a filterable virus as in the case of measles.

H. S. PAINE.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Effects of intravenous injections of a colloid (gelatin) upon rabbit sera. G. W. CLARK. Univ. Calif. *J. Immunology* 3, 147-56(1918).—The serum proteins of individual rabbits vary through a wide range and the variation is even greater between different rabbits. Intravenous injection of large amts. of gelatin does not produce any marked change in the ratio of the globulins to the total proteins. The gelatin begins to disappear from the blood immediately after injection and continues to do so at a fairly const. rate, being completely eliminated at some time between 6 and 24 hrs. A hydremic plethora results.

GEO. T. CALDWELL.

The influence of arsphenamine and mercuric chloride upon complement and antibody production. I. TOYAMA AND J. A. KOLMER. Phila. *J. Immunology* 3, 301-16(1918).—The intravenous administration of arsphenamine to normal rabbits in doses varying from 0.01 g. to 0.004 g. per kg. of body wt. did not result in an increased output of immune hemolysin to sheep cells but rather suppressed its production; smaller doses did not appear to retard hemolysin production to sheep and human cells but likewise they did not result in an increase. The smaller doses, however, generally produced a slight increase of agglutinin for sheep and human cells. Similar results were observed with HgCl<sub>2</sub>. A single large dose of arsphenamine (0.06 g. per kg.) administered intravenously to rabbits reduced the hemolytic activity of their sera within a period of 24 hrs. after injection, probably by an influence upon the hemolytic complement. The administration of a smaller dose (0.6 g.) to syphilitic persons as part of their treatment was found generally to produce a depression in the hemolytic activity of the serum as tested 1 hr. after injection, followed by a general increase within 18 hrs. Large doses of arsphenamine and HgCl<sub>2</sub> to rabbits tended to limit agglutinin production for typhoid bacilli; single doses of arsphenamine (0.6 g.) in adults did not influence the amt. of normal typhoid agglutinin in their sera.

GEO. T. CALDWELL.

The clinical pathology of mustard gas (dichlorethylsulfide) poisoning. G. R. HERRMAN. Ann Arbor. *J. Lab. Clin. Med.* 4, 1-30(1918).—Moderately severe and severe cases of mustard gas burns of the skin with some involvement of the upper respiratory tract show after the first week a diminution of the urinary output, increased concn. and acidity of the urine, albuminuria and diminished urea and chloride output. Coincident with these ordinary changes, the blood urea is found to be high, but approaches normal with the improvement in the urinary condition when fluids are forced.

GEO. T. CALDWELL.

The comparative values of some local anesthetics. H. C. HAMILTON. Detroit. *J. Lab. Clin. Med.* 4, 60-8(1918).—As a result of the intracutaneous administration in four cases it is definitely shown that novocaine is about  $\frac{1}{3}$  as efficient as cocaine, while apothesine is practically equal to cocaine in anesthetic value. That both novocaine and apothesine are inferior to cocaine by surface application agrees with clin. evidence which has demonstrated cocaine to be exceptionally rapid in its absorption from mucous surfaces.

GEO. T. CALDWELL.

The salicylates. X. The specificity of the salicylates in rheumatic fever. P. J. HANZLIK, R. W. SCOTT AND P. C. GANCHAT. Cleveland. *J. Lab. Clin. Med.* 4, 112-22(1918).—Salicylate seems to possess no thoroughly demonstrated sp. action in rheu-



matic fever. It is no more than a symptomatic remedy which can be safely administered in very large doses, and represents a very fortunate combination of both antipyretic and analgesic qualities. GEO. T. CALDWELL.

Cocaine poisoning. Report of a case with necropsy. E. KELLERT. Albany, N. Y. *J. Lab. Clin. Med.* 4, 129-32(1918). GEO. T. CALDWELL.

The ocular lesions produced by dichlorethylsulfide (mustard gas). A. S. WARTHIN, C. V. WELLER AND G. R. HERRMANN. *Ann Arbor. J. Lab. Clin. Med.* 4, 785-832 (1918); cf. *C. A.* 12, 2363.—The action of mustard gas upon the cornea and conjunctiva is essentially the same as that upon the skin. The amt. of necrosis produced in the conjunctiva is always less than that in the cornea or epidermis. Exposures to dil. concns. of the vapor produce slight degeneration of the corneal and conjunctival epithelium followed by simple conjunctivitis. Stronger concns. produce more or less complete necrosis of the corneal vertex extending throughout the entire depth of the cornea. No metastatic lesions of the eye could be produced exptly. by applications of mustard gas to other regions of the body, or by subcutaneous or intraperitoneal injections. For the mustard gas conjunctivitis, immediate irrigation with a 0.5 to 1% chlorcosane soln. of dichloramine-T followed by frequent irrigation with satd. boric acid soln. is recommended. GEO. T. CALDWELL.

The treatment of dichlorethylsulfide (mustard gas) injuries. A. S. WARTHIN, C. V. WELLER, L. ROOS AND G. R. HERRMANN. *Ann Arbor. J. Lab. Clin. Med.* 4, 833-48(1918).—Of clinical interest chiefly. GEO. T. CALDWELL.

The pharmacology of alcohol. R. B. WILD. Manchester. *Lancet* 1918, II, 623-5. GEO. T. CALDWELL.

Carrell method in infected war wounds. A. SANTUCCI. *Rend. d. adunanze dell'accad. med.-fis. Fiorentina; Sperimentale* 72, 309-25(1918). M. HEIDELBERGER.

Three-day, or "pappataci" fever. F. MICHELI AND G. SATTA. *Rend. d. adunanze dell'accad. med.-fis. Fiorentina; Sperimentale* 72, 399-400(1918).—Clinical findings are discussed. In cases of marked infection "salts of chemicals" do not show any prophylactic action, while in experimental infections arsenicals have a certain preventive power. An intravenous injection of neosalvarsan given during the 1st day results either in a sudden fall in the temp. or in a diminution of the fever and other symptoms. M. H.

Review of the relative and actual efficiency of medicaments for the sterilization of tooth structures. THOMAS B. HARTZELL. Univ. Minnesota. *J. Nat. Dental Assoc.* 6, 48-56(1919).—A summary of researches conducted by various investigators since 1909. JOSEPH S. HEPBURN.

Statistical study of poisonings in Japan. G. TAKATA AND M. KOMINAMI. *Kyoto Igaku Zasshi* 14, No. 6, 1-130(1917); *Jap. Med. Literature* 3, 63-6(1918).—A study of the 4893 cases of poisoning (suicidal, homicidal, medicinal, and accidental) officially reported in Japan during the years 1913-5. The following were represented by more than 50 cases each:  $K_2Cr_2O_7$ ,  $HgCl_2$ ,  $H_2SO_4$ ,  $HCl$ ,  $As_2O_3$ ,  $HCHO$ ,  $AcOH$ ,  $PhOH$ , morphine, strychnine, and rat poison. Other compds. used were:  $HNO_3$ ,  $KCN$ ,  $NaOH$ ,  $CuSO_4$ ,  $CO_2$ ,  $KMnO_4$ ,  $KOH$ ,  $K_2CrO_4$ ,  $KClO_3$ ,  $Na_2CO_3$ ,  $CHI_3$ ,  $AgNO_3$ ,  $NaNO_3$ ,  $Cu$  acetate, spirits, antifebrin, atropine sulfate, kerosene, sulfonal, heroine-HCl, cocaine, illuminating gas, green powder (probably Paris green). Other poisons recorded are: gold paint, green paint, *Aqua Pruni Armeniaceae*, bean oil, leaves, roots and berries of various plants, mushrooms (42 species), and certain animal foods. Chemicals were ordinarily used for suicidal purposes; the plants were either mistaken for edible ones or eaten, in excessive amt.; the animal foods either were unfit for consumption when eaten or were from the poisonous parts of certain animals. JOSEPH S. HEPBURN.

**Physiological action of tetrodonin, the toxin from the roe of the globe fish.** F. ISHIIHARA. *Tokyo Igakukai Zasshi* 31, No. 12, 12-55(1917); *Jap. Med. Literature* 3, 60(1918); cf. *C. A.* 12, 2020.—Tetrodonin is a cryst. compd., and a powerful nerve poison acting chiefly on the sympathetic system; it leaves the myo-neural junction intact. On injection, it produces a fall in blood pressure and circulatory slowing; the heart is greatly affected by tremors, fibrillation, and agitation; heart block finally occurs. In acting on the pupil, the oculo-motor and sympathetic post-ganglionic fibers are involved, but the endings remain intact. Through interference with the sympathetic, peristalsis is quickened, and secretion of perspiration and saliva is inhibited. Death probably results from a direct action upon the respiratory center, rather than from interference with the phrenic nerve. The toxin, in a concn. of 0.00002%, paralyzes a nerve fiber in 30 min., and a striated muscle in 1.5 hrs.; these tissues can be restored by washing. The toxin has very little action on the smooth muscle of the stomach, intestine, blood vessels, iris and bladder. JOSEPH S. HEPBURN.

**Ulcerative changes in the stomach induced by tobacco extract and nicotine solution.** T. HAYASHI. *Tokyo Igakukai Zasshi* 31, No. 21, 37-65(1917); *Jap. Med. Literature* 3, 60-1(1918).—Aq. exts. of tobacco and a soln. of nicotine neutralized with tartaric acid, were administered daily to guinea pigs by subcutaneous injection, producing poisoning just short of the fatal point. Uniform results were not obtained. A tendency to tolerance was overcome by either an occasional interruption of or an increase in the dosage. The stomach of a guinea pig normally is always full; expts. were made on such animals, and on animals which had been starved overnight. Ulceration of the stomach developed in 35% of the 20 guinea pigs which were given tobacco ext. and were allowed to feed as usual. In the animals which were starved overnight, gastric ulceration developed in 52% of the 25 pigs given tobacco ext., and in 30% of the 10 pigs given neutralized nicotine soln. "The ulcerative lesion produced was uniformly a hemorrhagic erosion, but in the early stages the mucosa was not affected superficially. The lesions were situated more commonly near the pylorus, but occasionally in the fundus. Sometimes there was hemorrhage, but always in the early initial stage there was definite anemia." Observations, made by means of the X-ray on the living animal's stomach after the injection, showed that a cramp-like contraction of the muscularis propria first occurred, producing an intense anemia, followed later by an ulcer. The ulcers were of the same type as those caused by pilocarpine and physostigmine. J. S. H.

**Distribution of iron compounds in the body after intravenous injection.** I. T. YAMADA. *Tokyo Igakukai Zasshi* 32, No. 1, 33-4(1918); *Jap. Med. Literature* 3, 77(1918).—Dogs were fed for ten days on soy bean residue obtained in the manuf. of Tofu or bean curd; then each dog was injected intravenously with 1 g. of ferratin and killed in 30 min. Chem. and histological examn. for Fe was made of the organs and tissues. "Nothing especially new was brought out except that this drug is a good one for exptl. work because its dose of efficiency is far from toxic." JOSEPH S. HEPBURN.

**Electrocardiographic investigation of the action of bufagin, a crystalline principle from the venom of the toad, and a comparison with that of digitalis.** S. SAKAI AND S. SHIMIDZU. *Tokyo Igakukai Zasshi* 31, No. 24, 1-19(1917); *Jap. Med. Literature* 3, 76(1918).—No essential difference in action was found between bufagin and the glucosides of digitalis, except that bufagin exerted a stronger and more toxic action. JOSEPH S. HEPBURN.

**The physiology of the stomach. I. Studies on the control of hunger by drugs.** HARRY GINSBURG AND ISIDOR TUMPOWSKY. Chicago. *Arch. Intern. Med.* 22, 553-570(1918).—Gastric fistulas were produced in 12 dogs; in four both the splanchnics and vagi were cut. The drugs were used on animals with "intact stomachs" with the nerves intact and on "isolated stomachs" having the peripheral nerves sectioned.

Hypodermic injections of atropine sulfate in doses of  $1/80-1/40$  gr. inhibited contractions and counteracted the effect of pilocarpine and eserine in this regard. The action takes place in 5-10 min. and persists for hrs. Since the reaction is the same with the isolated stomach, action is on the myoneural junction. Pilocarpine given hypodermically in doses of  $1/15-1/6$  gr. augments the contractions, at the same time giving a decreased pulse rate. The first dose is absorbed in 7-10 min. and subsequent doses in 5-10 min. The same effect is noticed on the section of the nerves, so pilocarpine is effective even after nerve degeneration. Eserine given subcutaneously has a long latent period; intravenously it produces stimulation which persists for 4 hrs. Similar results with the isolated stomach show that it acts on nerve endings. Cocaine gives profound inhibition with doses of 1 cc. of 0.5% cocaine per kg. Cocaine delays hunger pangs. Camphor as camphorated oil is only effective when administered intramuscularly. In large doses the contractions become more intense and frequent and the period of activity is prolonged. Strychnine furnishes no expl. evidence for its supposed gastric effect. There is a slight increase in hunger contractions. Direct application to Auerbach's ganglia causes stimulation. Amyl nitrate used in 5 minim pearls causes only temporary inhibition. The contractions which follow are not reduced in frequency, intensity or duration. The same inhibition is noticed in animals with nerves sectioned. After removal of the drug, tonus is depressed for a long time and returns gradually. Adrenaline causes prompt and marked inhibition of hunger contractions. Inhibition also occurs with the isolated stomach. Fluid extract of ergot given intravenously causes an increase in spontaneous movements of the alimentary tract. There is a temporary inhibition followed by lowered tonus, although contractions ensued. Fluid pituitary ext. caused an inhibition of short duration.

F. HULTON-FRANKEL.

**The effect of continuous intravenous injections of ethylhydrocuprein on experimental pneumococcus infections in rabbits.** JULIAN H. LEWIS. Chicago. *Arch. Intern. Med.* 22, 593-600(1918).—Ethylhydrocuprein can be injected into rabbits intravenously over long periods at the rate of 10 mg. per kg. per hr. without apparent toxic effects. When injected in this manner for 7 hours, it produces a slight bactericidal effect on the serum. If injected at the rate of 15 mg. per hour for 7 hrs. a greater bactericidal effect is produced. The injection of ethylhydrocupreine does not neutralize the effect of a fatal dose of pneumococcus. This method of administration with a suitable drug ought to be of advantage in the treatment of infections.

F. HULTON-FRANKEL.

**An experimental investigation of the toxicity of certain organic arsenic compounds.** GEORGE B. ROTH. Washington, D. C. U. S. Public Health Service, Hyg. Lab., *Bull.* 113(1918).—The toxicity of American and German salvarsan was tested by intravenous injection into rabbits and rats. On account of the decided variation in the susceptibility of the test animals employed, the only general conclusion which could be drawn from the expts. was that there was no marked variation, if any, in the toxicity of the various preps. examd., and that their toxicity in animals, in a general way, runs parallel with their As content.

JULIAN H. LEWIS.

**The early diagnosis of lead poisoning with special reference to abdominal pain.** GEORGE L. APFELBACH. *Am. J. Med. Sci.* 156, 781-95(1918).—Anemia is an early prognosis datum of Pb poisoning. This is associated with fine tremor. The rise of blood pressure was not constant. Nephritis, arterial disease and pulmonary tuberculosis are common accompaniments.

W. MORSE.

**Chlorinated alum solution for irrigation of infected wounds.** W. MESTREZAT. *Compt. rend. soc. biol.* 81, 504-5(1918).—In prep. this soln. (cf. *C. A.* 12, 232, 233) it is

indispensable that the alum soln. be free from  $\text{NH}_3$ , since  $\text{NH}_4$  salts react with  $\text{HClO}$ . The alum employed may be satisfactorily tested in the following manner: Dissolve 2 g. alum in 20 cc.  $\text{H}_2\text{O}$ , add 20 cc. of 30:100  $\text{NaOH}$  soln., shake, suspend a moistened red litmus paper above the liquid and close the container. The paper should not change color to an appreciable extent within 10 mins. if the alum is acceptable. Many samples of com. alum do not comply with this requirement. The amt. of alum required for prepn. of the chlorinated alum soln. is such that the latter, after diln. with an equal vol. of 20:100 hyposulfite soln., should show an acidity (phenolphthalein indicator) corresponding to 50-150 cc. of 0.1  $N$  soln. per l. The acidity of the final soln. may be tested by mixing 2 cc. horse serum with 6 cc. of the soln.; a soln. of correct acidity should ppt. the serum without causing coagulation *en masse*. Insufficient acidity is corrected by addition of alum and too great acidity by addition of  $\text{NaOH}$  soln. H. S. PAINE.

**Poisoning by water hemlock.** G. A. STUTTERHEIM. *Pharm. Weekblad* 55, 1494-7 (1918).—After some fatal cases of water hemlock poisoning, the poisonous principle *cicutine* was studied. It can be isolated by extg. with  $\text{EtOH}$  containing tartaric acid, and purifying from the soln. by evapg., taking up in  $\text{H}_2\text{O}$  and filtering. The residue may be dissolved again in  $\text{EtOH}$ , and the process repeated till the *cicutine* is pure. It is insol. in  $\text{H}_2\text{O}$ , but sol. in alk., from which it can be repptd. by acid. Atropine is the best antidote found so far. In children, 10 g. of the rhizome may cause death.

JULIAN F. SMITH.

POWERS, EDWIN BOOTH: The Goldfish (*Carassius carassius*) as a Test Animal in the Study of Toxicity. Urbana, Ill.: Univ. of Illinois. 73 pp.

## I. ZOÖLOGY.

R. A. GORTNER.

Artificial production of echinoderm larvae with two water-vascular systems, and also of larvae devoid of a water-vascular system. E. W. MACBRIDE. *Proc. Roy. Soc. London* 90B, 323-48 (1918).—From expts. on larvae of *Echinus miliaris*, it was found that exposure to the action of hypertonic sea water for a week commencing with the 4th day of development caused many of the larvae to develop an additional hydrocele or water-vascular rudiment with the accompanying structures (spines, tentacles, and dental sacs). Starvation of the larvae during the first week of their existence, followed by favorable conditions of food and space, caused many of the larvae to be devoid of hydrocele and certain other organs. The relation of hormones to these abnormalities is discussed.

JOSEPH S. HEPBURN.

The part played by calcium oxide of the shell of the hen egg in the formation of the skeleton of the chick during incubation. C. DELEZENNE AND E. FOURNEAU. *Ann. Inst. Pasteur* 32, 413-29 (1918).—The av. wt. of  $\text{CaO}$  in a fresh hen egg (of about 60 g.) is 0.0354 g.; it is about 0.067 on the 16th day of incubation, 0.129 on the 18th, 0.180 on the 20th, and reaches or even surpasses 0.200 on the 21st day at the time of hatching. The av. wt. per 100 of the  $\text{CaO}$  was 0.340 for the chicks at the time of hatching. The increase of  $\text{CaO}$  in the egg during the incubation is about 500%. In the non-fertilized but incubated hen egg, the wt. of  $\text{CaO}$  per 100 after 21 days is exactly the same as in the fresh egg. No trace of  $\text{CaO}$  has passed from the shell into the interior of the egg. In the egg of the peacock, the incubation period of which is 25 days, the wt. of  $\text{CaO}$  per 100 changes from 0.0964 to 0.457. In duck eggs, whose incubation period is 28 days, the increase in  $\text{CaO}$  is about 400%. The P content is not increased during incubation. These results show that the chick takes from the shell the greater part of the  $\text{CaO}$  necessary for its development and the formation of its skeleton.

GEO. T. CALDWELL.

## 12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

What to teach the public regarding food values. E. V. McCOLLUM. *J. Home Econ.* 10, 195-206(1918); cf. C. A. 12, 1069.—M. points out some of the mistakes made in teaching dietetics to the public. He advises the classification of foodstuffs on the basis of function rather than entirely on chem. compn., with special emphasis on the fact that most of the foodstuffs have deficiencies which are corrected by use of milk and of leafy vegetables. These foods are valuable because of the "fat-sol. A" and "water-sol. B" contained in them.

HELEN N. ELLIOTT.

The use of lime water in the preparation of soldiers' bread. BALLAND. *Compt. rend.* 167, 198-201(1918).—The amts. of lime added to the bread decreased the acidity only slightly. Usually the addition of lime could not be detected by taste and the quality of the bread was little changed.

L. D. ELLIOTT.

A quick method of calculating food values. CAROLINE L. HUNT. *J. Home Econ.* 10, 212-8(1918).—Tables and examples.

L. D. ELLIOTT.

The detection of coconut oil in butter by the Polenske method of distillation and the determination of the melting point of the phytosterol acetate according to Bömer. CHR. BARTHEL AND KLAS SONDEN. *Mon. sci* 8, 268-72(1918).—The  $n_{40}$  is a satisfactory figure for the rapid sorting of butters into genuine and doubtful samples, but because of the comparatively wide limits of the factor for pure butters and the small effect upon it of coconut oil, it cannot be considered more than a preliminary test. The Polenske and R.-M. values of all doubtful butters should be detd., and these factors compared with each other. The Polenske value for a R.-M. No. of 29-30 is about 3.5. The limits for pure butters are 1.7-3.4 and the R.-M. Nos. 25.7-31.2. Five % of coconut oil usually raises the P. No. above 3.4 but if the butter adulterated had a low value itself even 10% of coconut oil could not be detected in this way with certainty. Analyses of butters made from the milk of cows fed with 1.5 kg. of coconut cake per day indicate that such feeding, which is common in France, gives the butter an abnormally high P. No. Palm-nut cake, however, does not affect this figure appreciably. The feeding of beet leaves raises the R.-M. No. of the milk fat and to a lesser extent the P. No. and while the ratio between these two is not quite the same, perhaps, as for normal butter the P. No. may lie between 3.7 and 4.1 which are the figures corresponding to a R.-M. No. of 33.3-34.1, the values found for the butter of cows fed on beet leaf. Other feeds such as the legumes and beet pulp have little effect on the P. No. In those instances where the above tests do not give conclusive evidence of the purity of butter, the m. p. of the phytosterol acetate (Bömer method) should be detd. The m. p. should be between  $113^{\circ}$  and  $116^{\circ}$ , 10% of vegetable oil will raise the m. p. above  $117^{\circ}$  and even 5% can often be detected.

H. S. BAILEY.

Comparative study of the influence of various methods of preparation on the refraction of milk serum. A. J. H. KAM. *Versl. van het Centr. Lab. t. b. v. h. Staat-soets. op de Volksgesondh. over 1917*, 67-9(1918); *Chem. Weekblad* 15, 1390.—Milk serum was prepd. by the following means: spontaneous, HOAc (5 different ways),  $\text{CaCl}_2$ , rennet, asaprol, copper,  $\text{Zn}_2\text{Fe}(\text{CN})_6$ , tartaric acid and trichloroacetic acid. The best serums are the tetraserum of Phyl and Turnau, and those made with  $\text{Zn}_2\text{Fe}(\text{CN})_6$  and with  $\text{CaCl}_2$  according to Ackermann.

JULIAN F. SMITH.

Factors which influence the yield and consistency of ice cream. M. MORTENSEN. Iowa Agr. Expt. Sta., *Bull.* 180, 261-83(1918).—Fresh raw cream produced smaller yields of ice cream than cream which had been allowed to age 24 to 48 hrs., there being a difference of over 6%. The yield from pasteurized cream is also increased by aging.

Aged cream produces an ice cream of a better texture than that produced from fresh cream. Fillers have no influence on the yield of ice cream. A temp. of 6° F. for the brine is most desirable when using a 20% raw cream. For pasteurized cream a temp. of 8° to 10° gave best results. The holding of ice cream does not influence the distribution of fat. The texture, firmness and keeping qualities of ice cream are influenced by the air cells, the fillers added to the mixt. and the milk solids of the cream.

J. J. SKINNER.

**The calculation of the dry matter of milk from the fat and specific gravity.** J. J. OTT DE VRIES. *Vereeniging tot exploitatie eener proefsuivelboerderij te Hoorn; Jahresbericht 1916*, p. 107; *Biedermanns Zentr.* 47, 271-3(1918).—The tentative formula proposed as the result of analyses of twelve samples of Holland milk is  $t = 1.23 \times \text{fat} + 2.56(100s - 100)/s$ , where  $t$  is the dry matter and  $s$  is the specific gravity A. R. MERZ.

**Experiments to improve musty grain. II.** M. HEINRICH. *Versuchsstationen* 90, 49-67(1917).—Supplementing an earlier investigation (*Versuchsstationen* 88, 399 (1916)) on this subject, H. has tested a further method which consists of dusting the grain with a mixt. of powdered freshly ignited CaO and MgO in a bicarbonate compd., permitting this to remain in contact with the grain for a period and then mechanically removing it. The action of this procedure is claimed to be the removal of moisture from the grain by the oxides with the production of heat which causes part of the CO<sub>2</sub> in the bicarbonate to be liberated and change the hydroxides of Ca and Mg into harmless carbonates. The oxides are at the same time destructive of injurious NH<sub>3</sub> compds. which are formed in the moist store-room. The following results were established: No noticeable diminution of the moisture content was obtained in any case. With oats of moderately high moisture content the powder had a slight favorable action on the germinative power though it is questionable whether this is of practical significance. With oats of high moisture content there was no effect if storage was with free access of air. If storage was air-tight injury resulted from promotion of bacteria activity.

ALBERT R. MERZ.

**Occurrence and origin of nitrites in sausage and meats.** H. W. VAN URK. *Pharm. Weekblad* 55, 1450-5(1918).—In the usual practice, any nitrite present in meat preps. is detd. as nitrate. It would be much better to det. nitrites separately, since expts. have shown that a high nitrite content may be an indication of decay in meats. The origin is ascribed to reduction by microorganisms of added saltpeter. J. F. SMITH.

**Studies on the food plants of Formosa. I.** O. OKUMURA. *J. Tokyo Chem. Soc.* 39, 983-97(1918).—The swellings on *Fizania latifolia* Turcz., caused by the attack of *Ustilago esculenta*, P. Henn., are used as a food in the orient. A sample obtained from the Agr. Expt. Station ground, Formosa, Japan, gave the following analysis: H<sub>2</sub>O 90.36%, ash 0.58%, crude protein 1.03, protein N 0.16, non-protein N 0.05, Et<sub>2</sub>O ext. 0.69, crude fiber 0.87, sol. non-N matter 6.19, reducing sugar 3.46, dextrin 0.21, starch 1.22, pentosan 0.82; the ash contains SiO<sub>2</sub> 4.17, SO<sub>2</sub> 4.58, Cl 1.36, P<sub>2</sub>O<sub>5</sub> 3.71, Fe<sub>2</sub>O<sub>3</sub> 2.78, Al<sub>2</sub>O<sub>3</sub> 6.93, Mn<sub>2</sub>O<sub>3</sub> 0.27, CaO 0.39, MgO 1.78, K<sub>2</sub>O 55.28, Na<sub>2</sub>O 1.67%. From the warm 50% alc. ext., *d*-glucose was isolated; this is the main constituent of the reducing sugars. Adenine, histidine, arginine, stachydrin and choline were found in the 80% alc. ext.

S. KOMATSU.

**Chemistry of sweet-clover silage in comparison with alfalfa silage.** C. O. SWANSON AND E. L. TAGUE. *Kans. Agr. Expt. Sta. J. Agr. Research* 15, 113-32(1918); cf. C. A. 11, 2834.—In milk bottle containers silage was made from alfalfa, sweet-clover, and sweet-clover + ground corn 10:1. At intervals 3 samples were removed. Upon 1 detns. were made of loss of wt. and total H<sub>2</sub>O content. The 2nd sample was dild. with 4 times its wt. of H<sub>2</sub>O and to the 3rd enough EtOH was added to make the EtOH content

50%, and the H<sub>2</sub>O and EtOH extracts were used for detns. of: acidity as shown by titration with phenolphthalein and also by using the H electrode; amino N as shown by the method of Sorensen (*Biochem. Z.* 7, 45-101) and also by a modification of Sorensen's method using the H electrode to det. the end-point; total N; and total N not pptd. with phosphotungstic acid. The loss in wt. was approx. 1% on all samples. When titrated against phenolphthalein the alc. ext. showed higher acidity than the H<sub>2</sub>O ext., but using the H electrode and titrating to  $P_H$  8.3 the two exts. gave concordant results. The acidity of the 3 silages increased sharply for the 1st 15 days and then more gradually until about the 50th day; after this there was very little increase. The alfalfa required about twice as much alkali as the sweet-clover and the clover + corn had an acidity about midway between the two. The alfalfa silage was also higher in amino N than was the silage from the sweet-clover, while the addition of corn to the clover had little effect. The total N was about twice the amino N in all cases. The results would indicate that silage can be made from sweet-clover more easily than from alfalfa.

R. N. HARGER.

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Somatose (THOMSON) 11B. Tomato seeds (ANON.) 27. Effect of heat on the spores of *Bacillus botulinus* (BURKE) 11C. Determination of sugar in milk (SJOLLEMA) 11B.

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**Desiccated milk.** C. H. CAMPBELL. U. S. reissue 14,567, Dec. 17. See original pat. 1,233,446; C. A. 11, 2595.

**Cocoa fat; theobromine; caffeine.** E. DE GROUSSEAU and A. VICONGNE. Brit. 120,178, June 4, 1918. To obtain fat, theobromine, and caffeine from cocoa and chocolate waste, the waste is treated with a mixt. of tetrachloroethane and phenol in the presence of aq. NH<sub>3</sub>. The solvents are removed from the ext. thus obtained by distn., and the fat is removed from the residue by a solvent such as petroleum ether or dichloroethylene. The theobromine and tannin are next removed by treatment with soda or potash, and the theobromine is pptd. free from tannin by CO<sub>2</sub>. The extg. and distg. app. are specified. Cf. C. A. 12, 2111.

**Coffee substitutes.** J. L. KELLOGG and B. KAZMANN. Brit. 120,121, Nov. 15 1917. A dry sol. ext. for use as a substitute for coffee is formed by extg. with H<sub>2</sub>O a partially dextrinized and roasted starch-bearing material, and evapg. the ext. As starch-bearing materials, legumes, tubers, roots, fruits such as bananas, seeds such as cottonseed, St. John's bread, or algaroba beans, grain such as wheat, rye, barley, corn, Kaffir corn or rice, or fat-bearing beans such as soy beans or peanuts, may be used. Preferably a mixt. of wheat flour, rye flour, and bran or whole meal is used. The material is mixed with H<sub>2</sub>O, the dough obtained is formed into loaves which are heated under steam pressure for some time, to form dextrin. The loaves are allowed to dry in the air, pulverized, the particles are further dried, roasted, extd. with H<sub>2</sub>O, and the liquid ext. is evapd. and dried *in vacuo*. Cf. 17,255, 1915 (C. A. 11, 1501).

**Coffee substitutes.** J. L. KELLOGG and B. KAZMANN. Brit. 120,279, Nov. 15, 1917. In prepg. a coffee substitute by partially dextrinizing and roasting starch-bearing materials, as described in 120,121 (*supra*), malt, malt ext., *Aspergillus oryzae*, or other diastatic ferment or enzyme is added to the materials and the formation of maltose is prevented by the heating to cause dextrinization. The steps of extg. the roasted material and evapg. the ext. may be omitted.

**Leavening mixture.** F. B. LA FORGE. U. S. 1,288,428, Dec. 17. A mixt. of gulonic lactone with NaHCO<sub>3</sub> is prepd. for use as a leavening agent. The pat. is dedicated to the public for free use without payment of royalty.

## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

Can water for analysis be kept several days in the refrigerator? P. A. A. F. RIJKEN. *Geneesk. Tijdschr. voor Ned. Indië* 58, 163-7; *Chem. Weekblad* 15, 1519(1918).—This investigation showed that it is not advisable to keep water for bacteriol. analysis overnight in the refrigerator, even at 0°.

JULIAN F. SMITH.

Report on the investigation of the water supply for Banjermasin. G. GRIJNS. *Geneesk. Tijdschr. voor Ned. Indië* 58, 28-42; *Chem. Weekblad* 15, 1520(1918).—Bacteriol. analysis was used to decide which of 3 possible sources was the best to provide drinking water for Banjermasin.

JULIAN F. SMITH.

The diffusion of sewage. KENNETH ALLEN. *Munic. J.* 44, 483-5(1918).—See C. A. 12, 843.

LANGDON PEARSE.

TILLMANS, J.: Die chemische Untersuchung von Wasser und Abwasser. Band XVII der Laboratoriumsbücher für die chemischen und verwandten Industrien. 259 pp. Wilhelm Knapp: Halle (Saale). 1915. Price, 11.20 M.

Purifying water with base exchanging substances. P. DE BRÜNN. *Swed.* 44, 130, June 19, 1918. Zeolites or the like are employed. The compds. contain complex compds. of SiO<sub>2</sub> with some of the Al replaced by Sn, Zn, Pb, Zr, or Ti.

Treating ferruginous waters. L. S. HUGHES, *et al.* *Can.* 188,305, Jan. 21, 1919. Ferruginous water is subjected to the action of an oxidizing agent to convert ferrous into ferric salts, then to the action of limestone partially to neutralize the water and ppt. the iron and then to the action of magnesite to complete the neutralization and pptn. Cf. C. A. 12, 397.

Softening water. G. H. UECKE. *Can.* 188,499, Jan. 28, 1919. A water softening substance is regenerated by delivering upwards therethrough a rising column of regenerating liquid that is heavier than water and that is first relatively weak and then relatively stronger in the regenerating substance. Cf. C. A. 12, 966.

Water-softening apparatus. G. H. UECKE. *Can.* 188,498, Jan. 28, 1919. Structural features showing connections to the various chambers.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

The classification of soils according to their electric conductivity. BÉLA VON HORVÁTH. *Intern. Mitt. Bodenk.* 6, 231(1916); *Biedermanns Zentr.* 47, 283(1918).—After describing the method used for the detn. of the cond. of soils the values found are arranged and compared with the soil types. The conclusion is reached that an exact classification of all soils by this means is impossible. The circumstance that in the artificial alteration of the sequence of the soil strata, such as is brought about by plowing, the cond. of the uppermost layer is altered renders the possibility of such a classification especially questionable. The data given show plainly, however, that the cond. of a soil varies with depth.

ALBERT R. MERZ.

The alkali soils of Iowa. R. L. BANCROFT. *Iowa Agr. Exp. Sta., Bull.* 177, 187-232(1918).—In the alkali soils of this state Ca(HCO<sub>3</sub>)<sub>2</sub> is the principal salt. Other more harmful salts occur in insufficient amts. to be dangerous. These soils are reclaimed by drainage and applying farm manure. The greatest % of sol. salts is present in low areas in pasture soils, while in cultivated soils the amt. is much



greater at the high elevation, this being due to lack of drainage in the pasture soils, the salts accumulating in the low places. In the cultivated soils the salts are removed first from the lower places and more gradually from the higher places.

J. J. SKINNER.

The phosphoric acid in calcined soils. JOSEF SEISSL. *Z. landw. Versuchs.* 20, 212(1917); *Biedermanns Zentr.* 47, 241-3(1918).—Twenty-four soils were ignited in order to destroy the org. matter contained. The content of  $P_2O_5$  sol. in  $HNO_3$  (d. 1.2) after ignition exceeded that before ignition by 20 to 40%. The organically bound  $P_2O_5$  occurs in the form of proteins or as lecithins or phosphatides which are derived from the subterranean portions of plants or from incorporated leaves, the straw of stable-manure, the indigestible and undigested portions of animal food and the dead bodies of insects, snails, worms, etc. The relative order of availability for plant nutrition of org.  $P_2O_5$  compds. is lecithin, phytin and nuclein. Besides the direct absorption of these by plants there is undoubtedly a gradual decompn. into simpler org. and even inorg. compds. (processes promoted by the presence of basic substances such as lime and liquid manure) through the activity of microorganisms. ALBERT R. MERZ.

Studies on proteolytic activities of soil microorganisms, with special reference to fungi. SELMAN A. WAKSMAN. *J. Bact.* 3, 475-92(1918).—Different organisms behave differently in their power to attack proteins and in the production of amino N and  $NH_3$ . Most of the molds which grow very rapidly, as manifested by the increase in wt. of their mycelium, allow a small amt. of amino N to accumulate in the medium, while the amt. of  $NH_3$  accumulated increases with the period of incubation. Certain molds, particularly the slower growing ones, the actinomyces studied, and *B. mycoides* favor a large accumulation of amino N in the medium and a comparatively smaller accumulation of  $NH_3$ . The growth of *Aspergillus niger* upon a soln. containing peptone shows that the amino N produced in the medium is used by the organism, so that no great accumulation takes place.  $NH_3$ , on the other hand, which seems to be a waste product of the metabolism of the organism, accumulates readily in the medium, particularly when the organism stops growing and begins to autolyze. The process of ammonification in the presence of available carbohydrates, is found to be an autocatalytic chem. reaction. In the absence of available carbohydrates, the observed data deviated from the data calcd. by the use of the curve of autocatalysis. The study of ammonification is of doubtful importance in revealing the proteolytic activities of microorganisms, since the quantity of  $NH_3$  accumulated in the medium depends on a great number of controlling factors; it has not been proved as yet that  $NH_3$  is an end product of protein metabolism. Asparagine N is rapidly converted into  $NH_3$ , after the organism has made its max. growth; but, where the atm. of asparagine N is small, particularly in the presence of a comparatively large excess of available carbohydrates, no  $NH_3$ , or only a very small quantity of it, will accumulate in the medium.

JOHN T. MYERS.

The way in which nitrates and nitrites are formed in bog soils. TH. ARNDT. *Landw. Jahresb.* 51, 297-328(1917); *Biedermanns Zentr.* 48, 291-4(1918).—The theory, recently advanced by G. A. Ritter (*C. A.* 8, 1180) and based on his expts. with peat soil, that there is a possibility of the formation of nitrates chemically without the intermediation of nitrifying organisms in addition to their formation by the action of nitrifying bacteria could not be verified by A.'s expts. None of the samples of un-inoculated soil, regardless of whether or not  $CaO$ , nutritive ammoniacal soln. or  $(NH_4)_2SO_4$  or  $HgCl_2$  were added, showed any formation of  $HNO_3$  or  $HNO_2$  during the time of the expt. The quantities of  $NH_3$  originally present or added were still present at the expiration of the expt. in the limed and unlimed samples to which  $HgCl_2$  had been added; there was an evident diminution of  $NH_3$  due to assimilation of the ammoniacal

N in the limed samples to which  $\text{HgCl}_2$  was not added. Similarly no  $\text{HNO}_2$  formation took place in the unlimed samples inoculated with sandy soil or "Rohkultur;" the limed soils which had not received any  $\text{HgCl}_2$  showed, however, an active formation of  $\text{HNO}_2$ . "All exts. of samples which had been kept sterile with  $\text{HgCl}_2$ , whether limed or unlimed, inoculated or un-inoculated, or to which  $\text{NH}_3$  had or had not been added, showed that nitrification had taken place." The traces of  $\text{HNO}_2$  which were found in the inoculated samples were derived from the nitrate-containing sandy soil or the raw culture of nitrifying bacteria which naturally also contained nitrates. To meet the objection that the time chosen for the expts. was not sufficient a series of upland bog soils obtained from the collection of the institution was subjected to qualitative tests for  $\text{NH}_3$ ,  $\text{HNO}_2$  and  $\text{HNO}_3$ . These samples were gradually dried in the air at ordinary temp. With exception of one, which contained traces of  $\text{HNO}_2$ , all these soils contained  $\text{NH}_3$  and were entirely free from nitrites and nitrates. If the assumption of Ritter that there was a nitrification in raw, drying upland bogs were correct these would naturally have to give distinct reactions for nitrate. A. R. MERZ.

**The influence of plant residues on nitrogen fixation and on losses of nitrates in the soil.** H. B. HUTCHINSON. *J. Agr. Sci.* 19, Pt. 1, 92-111(1918).—Lab. expts., plot, and field tests were performed with soils and sand, using dextroses, sucrose, straw, and wheat stubble ground with elm leaves. The data corroborate the work of others and give definite evidence that the N content of sand or soil may be increased by the activity of *Azotobacter* when a suitable source of energy is supplied, sugars being the most effective, but plant residues are also beneficial. The lab. and field expts. agreed closely. The general soil conditions making for the successful operation of N-fixation are, in addition to the supply of some source of energy, a suitable temp., presence of phosphates, and basic materials such as  $\text{CaCO}_3$ . In order to avoid adverse processes, which finally adjust themselves, a crop should not be planted immediately following the application of the materials. Temp. is an important factor in detg. the duration of these adverse changes. R. B. DERMER.

**The influence of potsherds on nitrification in the Indian alluvium.** J. N. SEN. *J. Agr. Sci.* 9, Pt. 1, 32-42(1918).—From the detn. of nitrates in the percolates, which were obtained from mixts. of 3 lbs. per cu. ft. of barnyard manure and fine alluvial soils of Pusa with varying amts. of potsherds (0, 10, 20, and 30%) in jars, it appears that potsherds increase nitrification and that 30% are most beneficial. This is attributed to the introduction of more O into the soils which oxidizes the org. matter. In order to study the effect of drainage upon nitrification lysimeter pits, having only soil walls, were constructed and filled with manured soil of the same compn. and percentages of potsherds used in the pot expt. Soil samples were taken for the detn. of nitrates. In general the pits containing 30% potsherds contained the largest amts. of nitrates. The expts. extended over a period of 8 months or more. In the lysimeter expt. it was observed that in each tank the amt. of nitrates was practically the same for the first 3 months, a fact found to be true in actual practice. The influence of the rise and fall of a nearby river upon the amt. of nitrates in the soil is also discussed in detail. R. B. DERMER.

**Stable manure and nitrification in the soil.** II. CHR. BERTHEL AND N. BENGTSSON. *Kungliga Landbruks-Akad. Handlingar Tidskrift.* 57, 353-367(1918).—This part of the series of expts. on the nitrification of stable manure N in soil is concerned with the influence of Ca. The Ca is added as  $\text{CaCO}_3$ .  $\text{CaCO}_3$  in ordinary amts. seems to have no influence whatever. If the  $\text{CaCO}_3$  is added in large amts. it has an inhibitory effect but this is merely of academic interest, as the amts. needed to produce this are much above the amts. that will be used in ordinary agricultural practice. A. R. ROSE.

**Rational preparation of superphosphates.** Study of the relations connecting the technical process of preparation of superphosphates, chemical constitution and physico-mechanical characters of the product. A. AITA. *Ann. chim. applicata* 10, 45-103 (1918).—As regards the chem. process the industrial prepn. of superphosphates is to-day still carried out in an empirical direction. Only lately has important work been done in this field (Pratolongo, cf. *C. A.* 10, 3130; Aita, cf. *C. A.* 11, 682). Pratolongo asserts that the content in free  $\text{H}_2\text{PO}_4$  of superphosphates, besides depending upon the stoichiometrical relations of the reagents, is a close function of the temp. of reaction of formation. A. points out that this statement is clearly in contradiction to the detd. fact in the technical process of superphosphate prepn., i. e., that the use of concns. of  $\text{H}_2\text{SO}_4$  greater than ordinarily employed, effects a remarkable improvement in the physico-mechanical state of the product. To clear up this contradiction A. investigated the subject anew in order to verify and control the methods of extn. of free  $\text{H}_2\text{PO}_4$  from superphosphates. He then extended his studies further. In the system  $\text{H}_2\text{PO}_4\text{--CaO--H}_2\text{O}$ , which exists essentially in the system  $\text{H}_2\text{PO}_4\text{--CaO--H}_2\text{O--H}_2\text{SO}_4$  representing the formation of superphosphate, the following is true: Normally in it there is a solid phase formed of  $\text{CaH}_4(\text{PO}_4)_2$  and  $\text{CaHPO}_4$ , and a liquid phase composed not only of  $\text{H}_2\text{PO}_4$  and  $\text{H}_2\text{O}$  but also of  $\text{CaH}_4(\text{PO}_4)_2$ ; the estn. of the free  $\text{H}_2\text{PO}_4$  and of the  $\text{CaHPO}_4$  depends upon the quantity of  $\text{H}_2\text{O}$  that makes a part of the solid phase. Since com. superphosphates run from 12 to 20% in sol.  $\text{P}_2\text{O}_5$  and from 10 to 20%  $\text{H}_2\text{O}$ , they represent high concns. of  $\text{P}_2\text{O}_5$  in contact with low quantities of  $\text{H}_2\text{O}$ . On the basis of the statement above, the ideal superphosphate would have a content of free  $\text{P}_2\text{O}_5$  of from  $1/20$  to  $1/10$  of the total sol.  $\text{P}_2\text{O}_5$ . With this in view A. compared the estn. of free  $\text{P}_2\text{O}_5$  by the various methods available—extn. by 95% alc., abs. alc., acetone, anhydrous  $\text{Et}_2\text{O}$ ,  $\text{H}_2\text{O}$  either with direct titration or after addn. of K oxalate. If the solvent neither dissolves nor hydrolyzes the  $\text{CaH}_4(\text{PO}_4)_2$ , it will ext. from the product not the entire liquid phase but only  $\text{H}_2\text{O}$  and free  $\text{H}_2\text{PO}_4$ . With solvents absolutely anhydrous (e. g.,  $\text{Et}_2\text{O}$  free of  $\text{H}_2\text{O}$  by distn. over Na) there is not the least trace of CaO in the ext. Aq. solvents on the other hand, give exts. containing more or less considerable portions of CaO, which varies according to the proportion of  $\text{H}_2\text{O}$  present. Therefore extn. with  $\text{Et}_2\text{O}$  is the only method which furnishes results approximating to the content in free  $\text{H}_2\text{PO}_4$  theoretically, corresponding to the system  $\text{H}_2\text{PO}_4\text{--CaO--H}_2\text{O}$ . The aq. solvents, owing to their hydrolyzing action upon  $\text{CaH}_4(\text{PO}_4)_2$ , ext. from superphosphate appreciably greater fractions of  $\text{P}_2\text{O}_5$ , varying according to the amt. of  $\text{H}_2\text{O}$  they contain. Abs. alc., while containing no  $\text{H}_2\text{O}$ , behaves like an aq. solvent, the presence of the OH group in its structure causing hydrolysis of the  $\text{CaH}_4(\text{PO}_4)_2$ . Acetone may serve for extn. of free  $\text{H}_2\text{PO}_4$  from superphosphate if perfectly pure and anhydrous. By the use of the  $\text{Et}_2\text{O}$  extn. method, A. arrived at these conclusions from various expts. on preps. of superphosphate: (1) Fresh preps. have a higher content of  $\text{P}_2\text{O}_5$  than those seasoned; (2) free  $\text{H}_2\text{PO}_4$  of the liquid phase becomes gradually less and less and tends towards the theoretical amt. in normal superphosphates prepd. by exact stoichiometrical conditions of the reagents; in other words, the conditions altered by the temp. of the reaction during the technical process of prepn. proceed slowly to renew the definite equil. outlined in the system  $\text{H}_2\text{PO}_4\text{--CaO--H}_2\text{O}$ . These considerations (outside of the error due to his method of extn.) explain the increase in content of free  $\text{H}_2\text{PO}_4$  found by Pratolongo in samples of superphosphate treated in a closed tube in an autoclave at elevated temp. These increases correspond to states of false equil. so that the stable equil. altered by the temp. is not restored to the product except after a relatively long lapse of time. The  $\text{H}_2\text{O}$  contained in superphosphate (using the knowledge of the system  $\text{H}_2\text{PO}_4\text{--CaO--H}_2\text{O}$  as guide) can be looked upon as making up 2 fractions:— $\text{H}_2\text{O}$  of crystn. of the solid constituents,  $\text{CaH}_4(\text{PO}_4)_2$ ,  $\text{CaHPO}_4$ ,  $\text{CaSO}_4$ , and humidity, or more properly, the portion of  $\text{H}_2\text{O}$

moistening the product and forming part of the liquid phase. The distinction between these 2 fractions cannot be effected by the ordinary methods of drying at different temps. because heating of superphosphates liberates other substances than  $\text{H}_2\text{O}$ . *e. g.*,  $\text{HF}$ ,  $\text{SiF}$ , besides  $\text{H}_2\text{O}$  of crystn. of some of the salts of the product. Also increase of temp. creates various labile states of equil. in the chem. system out of which the superphosphate is formed, so that there does not correspond to a given temp. any definite state of the system and of the product. Therefore Pratolongo's method of detg. "true humidity" and  $\text{H}_2\text{O}$  of crystn. is erroneous and misleading. The use of  $\text{Et}_2\text{O}$  instead of  $\text{EtOH}$  avoids the errors of Pratolongo's method. A.'s method is as follows: Ext. 2 g. of the superphosphate with  $\text{Et}_2\text{O}$ , dry the fiber (previously tared) together with the residue in an oven at  $40^\circ$ , and weigh. The difference this wt. and the orig. 2 g., less the amount of free  $\text{H}_3\text{PO}_4$  found in the  $\text{Et}_2\text{O}$  ext., is the measure of the  $\text{H}_2\text{O}$  of the liquid phase. Keep then in a desiccator over 95%  $\text{H}_2\text{SO}_4$  to const. wt. The difference between the final wt. and the previous wt. gives the amount of  $\text{H}_2\text{O}$  of crystn. of the solid constituents. A. gives tables of superphosphates derived from various phosphorites, showing total  $\text{P}_2\text{O}_5$ ,  $\text{P}_2\text{O}_5$  sol. in  $\text{H}_2\text{O}$  and citrate,  $\text{P}_2\text{O}_5$  in the form of  $\text{H}_3\text{PO}_4$  extd., resp., with  $\text{Et}_2\text{O}$ , com.  $\text{Et}_2\text{O}$ , abs. alc., and 95% alc.;  $\text{H}_2\text{O}$  of the liquid phase and that of crystn., the acid used, the seasoning of the superphosphate, and its physico-mechanical properties. A. concludes (1) that the physico-mechanical characters of the superphosphate depend on the content of the product in  $\text{H}_2\text{O}$  and free  $\text{H}_3\text{PO}_4$  taken together. The free  $\text{P}_2\text{O}_5$  varies from 0.15 to 9.07%, the  $\text{H}_2\text{O}$  of the liquid phase from 1.33 to 15.90% and the  $\text{H}_2\text{O}$  of crystn. from 1.10 to 4.90%. (2) Free  $\text{H}_3\text{PO}_4$  and  $\text{H}_2\text{O}$  of superphosphate are intimately bound together, this condition depending particularly upon the concn. of the  $\text{H}_2\text{SO}_4$  employed, on the stoichiometrical conditions of the reagents taking part in the process of formation, but not depending upon the temp. of the reaction. A. divides superphosphates of commerce into 2 classes—normal and abnormal, the first class including those prepd. under exact conditions of stoichiometrical relations between reagents and with not too low concd. acid., the 2nd class including products obtained by defective treatment, either because of excess of  $\text{H}_2\text{SO}_4$ , of low concn. of  $\text{H}_2\text{SO}_4$  or both. J. Kolb (*Compt. rend.* 78, 825) inferred that the technical reaction of formation of superphosphates was carried out in 2 phases, (a) reaction of  $3\text{Ca}_3(\text{PO}_4)_2$  with  $6\text{H}_2\text{SO}_4$  to form  $4\text{H}_3\text{PO}_4$ ,  $\text{Ca}_3(\text{PO}_4)_2$  and  $6\text{CaSO}_4$ ; (b) reaction between  $\text{Ca}_3(\text{PO}_4)_2$  and  $4\text{H}_3\text{PO}_4$  to form  $3\text{CaH}_4(\text{PO}_4)_2$ . A., from analysis of the mixt. of phosphorite and  $\text{H}_2\text{SO}_4$  at different stages of the reaction, concluded that the  $\text{Ca}_3(\text{PO}_4)_2$  is attacked exclusively by the  $\text{H}_2\text{SO}_4$  in one reaction with formation of  $\text{CaH}_4(\text{PO}_4)_2$  and  $\text{CaSO}_4$ , with a velocity of reaction depending upon the fineness, nature and content in  $\text{CaO}$  of the phosphorite. In detg. the amount of  $\text{H}_2\text{SO}_4$  to be used to give the largest amount of sol.  $\text{P}_2\text{O}_5$  in the superphosphate, the method generally employed is to make repeated tests on new lots of phosphorite on the industrial scale, using varying amounts of  $\text{H}_2\text{SO}_4$ , and checking by analysis of the product. A. believes that equally good or better results can be obtained by the use of empirical factors in connection with the principal components of the phosphorite employed, *e. g.*,  $\text{Ca}_3(\text{PO}_4)_2$ ,  $\text{CaCO}_3$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{Al}_2\text{O}_3$ . The losses sustained by the mixt. of phosphorite and  $\text{H}_2\text{SO}_4$  depend largely on the temp. of the reaction. The temp. in turn depends upon the following factors: temp. of the reagents, concn. of the  $\text{H}_2\text{SO}_4$ , fineness of the phosphorite meal, nature of the phosphate mineral, and quantity of charge of the reagents. It is most desirable to employ in industrial prepn. the greatest concn. of  $\text{H}_2\text{SO}_4$  for the mixt. which is permitted by the app. in use and by reasons of a technical nature. A. considers 3 types of grinding mills: (a) Krupp ball mill, (b) Griffin hammer mill, (c) Kent roller mill. Types (b) and (c) are more recent and are preferred in modern plants to the ball mill because they are easier to handle and give comparatively higher yields for the same power consumption. A. studied the grinding action of (b) on different

varieties of phosphate rock, using the Appiani method of levigation to sep. the crushed mineral into 4 fractions, according to the rate of fall through water, *i. e.*, 0.2, 2, 7, 25 mm. per sec. He found that the hard or nodulous varieties (Land Pebble, Angaur) differ from the friable varieties (Gapa, Constantine) in that they give a meal of greater fineness the higher their degree of hardness. The character of the granules of the several varieties also differs. Under the microscope, granules of friable phosphate rock are rounder or with truncated angles, while granules of the hard varieties present sharply angular or flattened forms. The fineness of the meal favors rapid procedure of the reaction of formation, or at least a more complete solubilization of the  $P_2O_5$ . Present modes of treatment should not allow over 10–12%  $H_2O$ , nor over 1–2% of free  $H_3PO_4$ , expressed as  $P_2O_5$ , corresponding to about 0.05–0.1 of the total sol.  $P_2O_5$ . The existence of  $CaHPO_4$  is a sure guaranty of the normality of constitution of the product. Normally constituted superphosphate has excellent physicommechanical properties, *i. e.*, dryness, pulverulency, abs. absence of pastiness. Abnormally constituted superphosphate has the following characteristics: (1) content in  $H_2O$  of the liquid phase above 12%; (2) free  $H_3PO_4$  exceeding the limit of 2% on the wt. of the product, or expressed in  $P_2O_5$ , in excess of 0.1 of the sol.  $P_2O_5$ ; (3) limited amount or absence of  $CaHPO_4$ ; (4) prevalence or abs. presence of the anhydrous forms of crystn. of the salts  $CaH_2(PO_4)_2$ ,  $CaHPO_4$ ,  $CaSO_4$ ; (5) the physicommechanical state of the product is defective and poor, and varies with and depends upon the proportions of  $H_2O$  and free  $H_3PO_4$  present, till the product reaches such a degree of pastiness and acidity as to be practically useless and unadapted for spreading by hand or mechanically. A. makes the following suggestions leading to technical prepn. of a good product: (1) The  $H_2SO_4$  used should have a temp. of 20–30°; (2) the duration of the mixing of the ingredients should not be too long; (3) for hard and nodulous phosphate rock, the concn. of the  $H_2SO_4$  should be about 54° Bé., and 55–6 for friable phosphate rock, depending upon their degree of humidity; (4) the following factors of parts per part of constituent found in the phosphate rock should be used in calcg. the amount of 53, 54, 55, 56° Bé.  $H_2SO_4$  resp., that is to be used:  $Ca_3(PO_4)_2$ , 1.14, 1.11, 1.09, 1.07;  $CaCO_3$ , 1.46, 1.43, 1.40, 1.37;  $Fe_2O_3(1/2)$  and  $Al_2O_3(1/2)$  3.34, 3.25, 3.20, 3.12; not detd., 0.12, 0.11, 0.10, 0.09; (5) the weighing should be exactly made, and preferably in the ordinary way, since automatic weighing app. does not always give good results, probably because of the variable pressure exercised upon the columns of phosphate rock meal by different degrees of packing; (6) the charge used in mixing should not contain more than a cwt. of phosphate rock meal, and the time of mixing should be about 15–20 sec.; (7) abnormally constituted superphosphates should not be dried out by application of heat. A. recommends the following means as preferable: (a) employment of exhaust fan connected with the reaction chamber, one hr. after completion of charging; (b) drying in the cold by use of absorbents such as burnt powdered gypsum or infusorial earth, which are inert, or the use of reacting substances such as powder of bone or very friable phosphate rock. These should be sparingly and carefully employed, and their use is at best a mere expedient, in nowise substituting a rational method of prepn. of superphosphate.

ROBERT S. POSMONTIER.

The storage of calcium cyanamide in bags. MEYER. Breslau. *Illust. Landw. Ztg.* 1917, No. 58, p. 347; *Biedermanns Zentr.* 47, 286–7(1918).— $CaCN_2$  takes up moisture and  $CO_2$  from the air increasing in wt. and vol. Caking and hardening also occur.  $CaCN_2$  cannot be kept any length of time in jute bags, for these are attacked by the caustic lime contained. The increase of vol. also bursts them. In expts. to det. whether storage in paper bags would be less disadvantageous it was found that the increase of wt. was the same in jute or paper and whether stored in fertilizer sheds or on a stable floor of peat. This increase was 10.9% after 8 wks., 11.4% after 15 wks.

and 11.7% after 21 wks. storage. Essential differences in the total N content did not result from differences in the manner of storage. The av. N content of the outermost layer was 10.93% and in the center of the bag 14.31%. The exterior hardened layer had increased in wt. by 36.1% while an increase of 4.0% only took place in the center. Conversion of cyanamide into dicyanamide to the extent of 7.9% took place in the outermost layer while this reached but 3.5% on the inside. Formation of dicyanamide seems to be greater in warm weather than cold. Small lots of  $\text{CaCN}_2$  may be preserved by emptying them from the bags and covering them in a dry room with a layer of Thomas slag meal or by several layers of dry fertilizer bags or dry peat.

ALBERT R. MERZ.

**Is phonolith a nitrogen fertilizer?** E. BLANCK. *Landw. Versuchs-Sta.* 90, 33 (1917); *Biedermanns Zentr.* 47, 283 (1918).—A series of samples of phonolith was investigated with respect to their content of total N and ammoniacal N in order to ascertain the basis of L. Hiltner's (*Landw. Jahrb. für Bayern* 5, 819 (1915)) assertion of the important properties of this eruptive-rock meal. The conclusion is reached that there is no N worth mentioning in phonolith. Also that the results of Hiltner are ascribable to the beneficial effects of  $\text{P}_2\text{O}_5$ .

ALBERT R. MERZ.

**Fertilizing effect and the utilization of some nitrogenous fertilizers.** C. EBERHART. Leipzig-Möckern. *Deut. Landw. Presse* 44, 441-2, 456 (1917); *Biedermanns Zentr.* 47, 151-5 (1918).—The fertilizing value and the comparative money value of a number of nitrogenous fertilizers brought into use as a result of the war were ascertained by a series of pot expts. of one year's duration using barley. The presence of thiocyanates in fertilizers is injurious to plants if the fertilizers are applied directly or during or shortly before the growing season.

ALBERT R. MERZ.

**Contributions to the bacteriological-chemical transformation of milk protein, especially galalith, in the soil.** E. BLANCK. *Landw. Vers. Sta.* 90, 17 (1917).—Expts. were conducted in a light sandy soil with galalith waste to ascertain the changes undergone by the protein of milk in the soil and its fertilizing value. The conclusion is that judging by the result of the cleavage of  $\text{NH}_3$  from the galalith the decompn. is a very slow process. No nitrification of the  $\text{NH}_3$  could be observed. Nor could a fixation of N in the form of bacterial protein be established. On the whole galalith would be a slow but steady source of N for plants in the sandy soil.

ALBERT R. MERZ.

**Manurial experiments with sea island cotton in St. Vincent in 1917-18.** S. C. HARLAND. *West Indian Bull.* 17, 69-79 (1918); cf. *Ibid* 16, 169-202 (1917).—Expts. with no fertilizer; N; P; K; P and K; N, P, and K; cottonseed meal; cottonseed meal, P, and K were conducted for 2 seasons. The number of flowers opening daily in every plot was recorded for a period of 5½ months, and the number of bolls opening daily in every plot was recorded for 53 days. All the manured plots showed increases over the unmanured in yield per acre, the greatest increase being upon the plot receiving K alone but a large gain was also shown on the complete fertilizer plot. The addition of P to K lowered the yield. No effect upon the time of maturing of the crop was produced by the fertilizers, likewise none upon the % of bolls to flowers. Results as to yield for the 1916-17 expts. closely parallel those of 1917-18.

R. B. DEEMER.

**Experiences in the cultivation of the sunflower.** C. KRAUS. München. *Deutsche landw. Presse* 44, 455-6 (1917); *Biedermanns Zentr.* 47, 256-8 (1918).—Cultivation of the sunflower resulted in complete failure as 90% of the heads had rotted on the plants at the time of harvesting. Chem. analysis of the seed of the sunflower gave 25.20% protein and 50.24% fat. Analysis of the hulls gave  $\text{H}_2\text{O}$  7.16%, protein 4.37%, fat 1.14%, N-free ext. 63.00%, crude fiber 20.73% and ash 3.60%. Cold pressing of the hulled, finely ground seeds gave 21.1% of a savory yellow oil. A second pressing raised the yield to 36.3%. The residues after the second pressing contained

2.04%  $H_2O$ , 37.96% protein and 27.60% fat. The yield of oil from sunflower seed is much less than that from rape or poppy. With regard to the utilization of the soil for the production of fat the sunflower is quite inferior to other oil-yielding plants. Its cultivation secondarily in gardens and in potato and turnip fields deserves consideration but it is doubtful whether it can be profitably raised as a large field crop.

ALBERT R. MERZ.

**Green-manuring experiments during the years 1910 to 1915.** W. SCHNEIDEWIND. *Arbeiten der deutsch. Landw. Ges.* 1917, No. 289; *Biedermanns Zentr.* 47, 246-51 (1918).—Expts. were conducted on a humus-containing loess loam with a crop rotation of wheat, sugar beets, barley and potatoes and on a dry sandy soil with a crop rotation of rye and potatoes. Various clovers, peas, beans and vetch, serradella, and blue and yellow lupines were used as green-manuring plants.

ALBERT R. MERZ.

**The question of the inoculation of grains and "Hackfrüchte."** M. HOFFMANN. Berlin. *Deutsch Landw. Presse* 44, 494-5 (1917); *Biedermanns Zentr.* 47, 188-9 (1918).—"U-cultures" (C. A. 13, 52, 53) should be tested by technical institutions in order to ascertain whether they are of value.

ALBERT R. MERZ.

**The inoculation of grains, "Hackfrüchten" and other cultivated plants with "U-cultures."** A. KÜHN. *Deutsch. Landw. Presse* 44, 467-8 (1917); *Biedermanns Zentr.* 47, 261-3 (1918); cf. C. A. 13, 52, 53.—Controversial.

ALBERT R. MERZ.

Waste pulp from New Zealand hemp (ANON.) 25.

**Fertilizer from gas liquor.** A. SCHUBERT. Swed. 44,244, July 10, 1918. The gas water from coke manuf. is mixed with crude tar and distd. at a temp. above 200°. The distillate is sepd. and  $H_2O$  added.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

**The bitter principles of hops.** W. WÖLLMER. *Bericht über die Tätigkeit der Wissenschaftlichen Station für Brauerei in München; Chem. Ztg.* 1917, No. 80/90, p. 149; *Biedermanns Zentr.* 47, 158-9 (1918); cf. C. A. 12, 1099.—The cryst. bitter principles of hops, the so-called  $\alpha$ - and  $\beta$ -bitter acids, have the formulas  $C_{21}H_{30}O_4$  or  $C_{26}H_{30}O_6$ . The supposition that both substances are not true acids but that their acid character is attributable to the presence of hydroxyl groups was confirmed and consequently these substances are more appropriately termed "humulone" and "lupulone." Humulone cleaves to form  $CO_2$ , isopentane and a hitherto unknown substance, the disubstituted "tetraoxybenzene,"  $C_{10}H_{14}O_6$ , taking up 6 atoms of H. Lupulone splits into the same isopentane and a substance  $C_{21}H_{34}O_4$  which was not obtained in the cryst. state but in the form of its benzene compd. and its oxidation product  $C_{21}H_{34}O_6$ . This substance shows the greatest similarity to humulone in its chem. and phys. properties, and is probably its tetrahydro deriv. Both substances behave exactly analogously on boiling with alkali, humulone forming humulin acid,  $C_{15}H_{22}O_4$ , and an unsatd. acid  $C_6H_{10}O_2$ , while the substance  $C_{21}H_{34}O_4$  forms dihydrohumulin acid and a caproic acid, substances which each possess 2 H atoms more than the analogous cleavage products of humulone. The proportion of humulone to lupulone in hops is subject to great variations. They are undoubtedly the bearers of the antiseptic and bitter powers of hops in the brewing process.

ALBERT R. MERZ.

**Malt extract with high diastase content.** I. POLLAK. Holl. 2,626, Oct. 1, 1918. Malt is repeatedly dried by heating in the presence of  $CaCO_3$ , and the dried residue is

then saccharified in the purified wort, with cooling, together with the diastase ext. previously obtained. Small quantities of strong reducing agents are added to prevent the growth of lactic acid bacteria. The product is evapd. to a thick sirup.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

An institute for coöperative research as an aid to the American drug industry. *J. Ind. Eng. Chem.* 11, 157-61(1918); cf. *C. A.* 13, 161, 246.—Letters are published from WILLIAM OHLIGER, B. L. MURRAY, FREDERICK FENGER, JOHN URI LLOYD, CHAS. E. VANDERKLEED, ALBERT C. CRAWFORD, ARTHUR D. HIRSCHFELDER and DENNIS E. JACKSON. E. J. C.

Preparation and chemical evaluation of tincture of strophanthus. HANS HELCH. *Pharm. Post* 51, 197-9(1918).—In order to det. whether the fat in strophanthus seeds produced the objectionable diarrhoeic properties of the tincture, a series of tinctures from normal and defatted Kombé seeds were prepd. by maceration with dild. and concd. alcs. and their effects studied. Dild. alc. was found to yield the best tincture; one prepd. therewith had a higher strophanthin content. Under similar conditions, the decompn. of the strophanthin to strophanthidin did not occur to such an extent as to lower its amt. below that in a tincture prepd. with concd. alc. The strophanthin content of the seeds was not influenced by the extn. of the fat with petroleum ether. The soly. of the oil is so low that the oil content of a tincture prepd. from normal seeds amts. to hardly 1 mg. in 10 drops. A tincture prepd. from normal seeds according to the method of the Austrian pharmacopoeia did not produce diarrhoea.

C. O. EWING.

The influence of the presence of stems and roots upon the total alkaloid content of the leaves of stramonium. GEORGE P. KOCH. *Am. J. Pharm.* 91, 11-6(1919).—Expts. show that the moisture content of the various portions of stramonium plants are as follows: Leaves 80 to 85%, secondary stems 87 to 92%, primary stems 85 to 87%, and roots 78 to 82%. When the whole plant, not including the root, is considered, the ratio of the leaf to the whole stem is about 47.5 to 52.5. In considering the leaf, stem and root, the leaf represented about 41% of the whole. The total mydriatic alkaloids, of the leaf and secondary stems when analyzed individually or the leaves with 10% of the secondary stems, run much higher than the U. S. P. requirement. The whole plant either with or without the root can be harvested and used for the commercial prepn. without fear of the total alkaloid content falling below 0.25%, which is the desired standard.

W. G. GAESSLER.

The early history of percolation. JAMES F. COUCH. *Am. J. Pharm.* 91, 16-25 (1919).

W. G. GAESSLER.

Churchill's tincture of iodine. History, experiments and improved formulas. HERBERT C. RAUBENHEIMER. *Am. J. Pharm.* 91, 37-45(1919).—Expts show that there is insufficient KI in the tincture completely to dissolve the entire amt. of I, that the proper amt. of KI to be added to the present N. F. tincture is between 5 and 6 g. per 1000 cc., and that a tincture with either of the following 2 formulas could be used with better results than the present prepn. of the N. F.: Formula No. 1: 16.5 g. I, 3.85 g. KI, 25 cc. water, sufficient alc. to make 100 cc. Formula No. 2: 16.5 g. I, 3.83 KI, 25 cc. water, sufficient alc. to make 100 cc. If the tincture is to be used immediately after dispensing, it is best to use the 3.85% KI, but if it is to be put away on the shelf until needed, as is the case in most drug stores, 3.83% KI will be sufficient. Another modification (Formula No. 3: 16.5 g. I, 3.3 g. KI, 3 cc. water, and sufficient alc. to make



100 cc.) will be found to be stable and can be made more readily than the tincture containing the 25 cc. of water because the alc. % has been increased; this greatly helps to dissolve the I.

W. G. GARSSLER.

**Neutral Dakin's solution:** diminution of the amount of boric acid used in its preparation. C. PAGEL. *Bull. sci. pharmacol.* 25, Pt. 2, 263-5 (1918).—The use of  $H_3BO_3$  and indicators in the neutralization of the excess of  $Na_2CO_3$  may be avoided by adding a soln. of  $CaCl_2$  after mixing the  $Ca(OCl)_2$  and  $Na_2CO_3$  solns., the  $CaCl_2$  being added in small portions until no further ppt. is formed. The  $CaCl_2$  may be prepd. by dissolving the  $CaCO_3$  pptd. in the reaction in the minimum amt. of HCl. The method has given satisfactory results in the hospital at Villemanzy.

M. HEIDELBERGER.

**Extracts and undetermined organic constituents of mistletoe:** their blood-pressure reducing power. BONNAMOUR AND NIQUET. Lyon. *Bull. sci. pharmacol.* 25, Pt. 2, 283-92 (1918).—Details for the prepn. of the alc. and aq. exts. are given. Mistletoe from the hawthorn (A), apple tree (B), and poplar (C) was used, all the exts. producing a fall in the blood pressure of the rabbit, (B) being the most active. (A) and (B) also caused a marked slowing of the pulse rate. (A) in aq. or alc., and (B) in aq. soln. were not toxic in the doses used, while (B) in alc. and both exts. of (C) caused convulsive movements and the death of the animals. A concn. of the depressor principles was obtained by dissolving each of the exts. in its own wt. of  $H_2O$ , pptg. inactive saponins by adding 9 vols. acetone, evapg. the acetone after letting stand and decanting, taking up the residue in  $H_2O$ , and pptg. with  $Ca(OH)_2$ . The ppt., which yielded inactive substances, was discarded and the filtrate made alk. and extd. with  $Et_2O$  to remove alkaloids, then acidified with  $H_2SO_4$  and again extd. with  $Et_2O$  to remove org. acids. The aq. liquid was then treated with  $\frac{1}{2}$  its vol. of acetone and satd. with  $(NH_4)_2SO_4$ , the acetone sepg. and carrying with it the undetd. org. constituents of the mistletoe, containing the depressor substances. After concg. *in vacuo*, sepg. from a trace of  $(NH_4)_2SO_4$  by taking up in abs. alc., filtering, and again concg., a soft ext. was obtained, which, when taken up in aq. acetone, caused a marked lowering of the blood pressure, the preps. from the original alc. exts. being particularly active. The concentrate seemed to be unattacked by alc. NaOH, but when evapd. at 50-60° with  $Ac_2O$  it yielded square crystals; at higher temps. a volatile substance is produced. Tracings of the animal expts. are given.

M. HEIDELBERGER.

**Detection of denatured alcohol in officinal opodeldoc balsam.** BOUCHER. *Bull. sci. pharmacol.* 25, Pt. 2, 295-6 (1918).—Melt on the  $H_2O$  bath, dil. 5 cc. with 10 cc.  $H_2O$ , add 10 drops satd.  $CaCl_2$  soln., filter, and distil 7-8 cc. of the filtrate, collecting 2 portions of the condensate of 2.5 cc. each. To 1 add KI-I soln. and aq.  $NH_3$ , a ppt. of  $CHI_3$  after 0.5 hr. being considered a positive test. To the other portion add 5 cc. 1%  $KMnO_4$  soln. and 0.2 cc.  $H_2SO_4$  and shake. After 5 min. shake with 1 cc. satd.  $(CO_2H)_2$  soln. and mix with 1 cc. concd.  $H_2SO_4$  and 5 cc. fuchsin bisulfite soln.; a rose-violet color after 15-30 min. indicates HCHO (Denigès' test). These tests are sufficient to detect the acetone or MeOH used in the denatured alc., and are negative with authentic opodeldoch balsam.

M. HEIDELBERGER.

**Saffron from Kosani.** VALDIGUIÉ. Commercial Bureau of the Army of the Orient. *Bull. sci. pharmacol.* 25, Pt. 2, 302-4 (1918).—The Macedonian article corresponds to the best French variety. The red and yellow varieties gave, resp.,  $H_2O$ , 8.5, 11.1%; ash, 5.1, 9.95%; ext., 58, 41.4%; coloring power, greater than 1:50000, 1:10000. The red variety is rich in crocein, while the yellow species contains very little. The filaments are very much more delicate than, for example, those of the Spanish variety, 50 weighing only 110-30 mg. Samples with excessive moisture are common. Other details of botanical and com. interest are given.

M. HEIDELBERGER.

**Horehound.** HENRI LECLERC. *Bull. sci. pharmacol.* 25, Pt. 2, 310-5(1918).—Historical sketch, from the earliest times to L.'s recent work. M. H.

**Concentrated sucrose solution as a general excipient in intravenous injection of irritant substances such as gold tricyanide, quinine and mercuric cyanide.** GEORGES ROSENTHAL. *Compt. rend. soc. biol.* 81, 919-20(1918).—Intravenous injection of 2 mg.  $\text{Au}(\text{CN})_3$  in 5 cc. concd. sucrose soln. was well tolerated. Little or no irritant effect was observed in the case of intravenous injection of quinine or  $\text{Hg}(\text{CN})_2$  in concd. sucrose soln. as an excipient. The use of this excipient is recommended as a general procedure for increasing the tolerance of the organism toward intravenous injections of various irritant substances. H. S. PAINE.

**Iodine soap and other iodine preparations.** N. O. ENGFELDT. *Svensk Farm. Tidskrift* 22, 309-14, 325-6, 341-7(1918).—Iodine soap is recognized in the Swedish Pharmacopeia but not generally recognized in the Pharmacopeias of other nations. It is prepared by working 7 g. I crystals into 73 g. soap. In the freshly prepd. soap there is hardly any free I. The I is combined mostly with the unsatd. fatty acids. In old soaps there is some free I, at most 4.7% of the I added is free. There is a change taking place in the prepn. as soon as it is compounded in which HI is formed. This reacts with the alkali so that about half of the I added is in the form of KI when the equil. has been reached. Glycerol in the soap plays no part in the state of I in the so-called iodine soap. The fats take up I in soln. In such prepn. as Jodi vasolimentum, Olementum Jodi, and Oleogenum jodi the I is mostly in the form of  $\text{NH}_4\text{I}$ . A. R. ROSE.

**Digitalis leaves: effect on activity of temperature in drying.** HERBERT C. HAMILTON. *J. Am. Chem. Soc.* 41, 125-9(1919).—Fresh leaves were gathered from the flowering and fruiting plants in July, divided into 3 equal amts. and treated as follows: (1) Extd. immediately with 95% alc. for moistening and then with 70% alc. to complete exhaustion; (2) dried in an oven between 70° and 90° (about 5 hrs.) and then extd. with 70% alc.; (3) dried in the air and partly in the sun for 4 days, then extd. with 70% alc. The tinctures were made to the same amt. on the basis of the oven-dried lot and assayed by the M. L. D. method on the frog (Houghton, *J. Am. Med. Assoc.* 31, 959(1898)). The fresh drug was found to be more toxic than the dried, and the high temp. in the oven drying caused a greater immediate deterioration than the air drying. CHAS. A. ROUILLER.

**Cinnamon bark from the gold coast.** ANON. *Bull. Imp. Inst.* 16, 146-7(1918).—A sample of cinnamon bark from the Gold Coast when distd. yielded 1.18% heavy oil separated from aqueous distillate and 0.30% light oil extd. by  $\text{Et}_2\text{O}$  from the distillate. The heavy oil had a sp. gr. 1.042, refractive index 1.603, aldehydes 86%. The entire oil yielded 68% aldehydes. R. L. SIBLEY.

**Balsam of Copaiba from Colombia.** ANON. *Bull. Imp. Inst.* 16, 147-9(1918).—This balsam is a semi-liquid oleoresin obtained from leguminous trees belonging to the *Copaifera*. The balsam was yellowish, acrid and of bitter taste. The sp. gr. was 0.961, acid value 79.8, ester value 11.7, yield of essential oil 45.5%. The balsam and volatile oil satisfied the requirements of the British Pharmacopeia and would be suitable for medicinal use. R. L. SIBLEY.

**Tobacco from Ceylon.** ANON. *Bull. Imp. Inst.* 16, II, 149-59(1918).—Twenty-six samples of tobacco were examd. and the analyses of 9 are reported as follows: moisture 14%, nicotine 1.7 to 4%, N 1.9 to 3.2%, ash 15.5 to 24.6%. The ash contained: CaO 27.1 to 34.8%, MgO 3.3 to 7.6%,  $\text{K}_2\text{O}$  6.7 to 22.7%,  $\text{Na}_2\text{O}$  1.9 to 5.0%,  $\text{SO}_2$  1.7 to 3.9%, Cl 7.6 to 15%,  $\text{CO}_2$  6.6 to 18.1%. The samples were all grown in the same locality and were subjected to the same treatment (air curing). Among the con-

clusions reached was that the soil was too rich in org. N but was deficient in potash salts. The analyses of 5 other samples received 2 yrs. later are also given. Estimates of the selling value of the samples are included.

R. L. SIBLEY.

Fiji bay oil. ANON. *Bull. Imp. Inst.* 16, 244(1918).—The leaves of the bay tree (*Pimenta acris*) are frequently mixed with those of 2 other forms (*Pimenta citrifolia*) which contains citral and *Pimenta anise* which contains anise) both of which are undesirable. One sample which possessed an odor of bay oil as well as an anise odor gave the following constants on examn.: sp. gr. 0.961, opt. rotation  $-1^{\circ} 58'$ . The oil was sol. in equal vol. EtOH and contained only 23% phenols as compared with 60% found in good bay oil. It was unusually rich in methyl esters.

R. L. SIBLEY.

Wild anthemis, a possible matricaria adulterant. C. W. BALLARD. *J. Am. Pharm. Assoc.* 7, 952-4(1918).—Histologic differences are described.

L. E. WARREN.

The seasonal variation of acidity, toxicity and alkaloidal content of three species of larkspur. O. A. BEATH. *J. Am. Pharm. Assoc.* 7, 955-8(1918).—The species studied were *Delphinium geyeri* (low larkspur) *D. glaucescens*, and *D. subalpinum* (tall larkspur). The altitudes at which the species flourish are in the order named, 5000-7000, 8000 and 9000-13,000 feet. The acid probably is an isomer of aconitic acid,  $C_8H_6O_6$ ; m.  $166-7^{\circ}$ ; non-toxic; optically inactive; sol.  $Et_2O$ , EtOH, and  $H_2O$ ; Ag salt detonates on heating; Et ester b<sub>m</sub>  $171-2^{\circ}$ . The acid exists combined with alkaloids and also free in considerable excess. *D. glaucescens* contains a white, cryst. alkaloid which is not very toxic. This combines with the non-toxic acid to form an amorphous complex which is highly toxic. In order to det. the stages of growth at which the plants were most poisonous whole specimens were selected, dried and carefully powdered. The drug was percolated with EtOH, the solvent evapd., the residue extd. with pet. ether to remove fats and resins, the crude alkaloidal residues were taken up in 70% EtOH and made up to definite vols. The solns. were intravenously injected into rabbits and the amts. necessary to produce symptoms or death noted. *D. glaucescens* is much less poisonous than the other species studied and the toxicity does not change with the advance in growth. *D. subalpinum* becomes more toxic as the flowering season approaches. *D. geyeri* and *D. subalpinum* represent extremes in size, yet the physical properties of the poisons sep'd. from them are very similar while the poison complex from the intermediate species, *D. glaucescens*, is markedly distinct from the others. The principal alkaloid from this species is cryst., optically active and is present at all stages of growth. *D. geyeri* yields amorphous alkaloidal products only. *D. subalpinum* contains 1 cryst. alkaloid in the early stages of growth but this soon becomes amorphous as the plant develops. In the detn. of the alkaloids care must be taken not to use alkali or too high concn. since decomposition may result. According to season *D. glaucescens* was found to contain from 0.25 to 0.6% of alkaloids; *D. subalpinum* from 0.3 to 0.7; and *D. geyeri* from 0.7 to 1.5%.

L. E. WARREN.

Continuous percolation under reduced pressure. J. G. BEARD. *J. Am. Pharm. Assoc.* 7, 964-6(1918).—Essentially a modified Soxhlet without the siphon discharge tube but with an outlet at the bottom as in percolators of the usual form is described.

L. E. WARREN.

Carbon tetrachloride as a solvent for fats. J. B. SNYDER. *J. Am. Pharm. Assoc.* 7, 966-7(1918).—The U. S. Pharmacopoeia directs the use of petr. ether for the extn. of fats and oils from certain drugs preparatory to making the fluidexts. The odor of this solvent persists on the drug, eventually appearing in the finished prepn., its use is expensive and a dangerous fire risk. S. finds that  $CCl_4$  is a satisfactory substitute from each of the objectionable viewpoints.

L. E. WARREN.

**Pharmaceutical war babies.** C. P. WIMMER. *J. Am. Pharm. Assoc.* 7, 967-71 (1918).—Review of the therapy and pharmacy of a number of medicaments introduced during the world war.  
L. E. WARREN.

**A report on Dakin solution.** I. A. BECKER. *J. Am. Pharm. Assoc.* 7, 971-2 (1918).—Specimens of Dakin soln. were prep'd. from assayed materials, the resultant preps. assayed and the products assayed again from time to time while in storage. A progressive loss in strength was observed, amounting to as much as 46% in 18 mo. The loss during the first few weeks is insignificant and in therapy may be disregarded.  
L. E. WARREN.

**The use of logarithms and anti-logarithms in pharmaceutical assaying.** H. L. THOMPSON. *J. Am. Pharm. Assoc.* 7, 972-91 (1918).—Discussion and comprehensive tables.  
L. E. WARREN.

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The ignition of boric acid (BAGSHAW) 7. Terpenes and ethereal oils (WALLACH) 10.

**Antiseptics, etc.** G. B. PEGRAM. *Brit.* 117,451, June 20, 1918. The soly. in H<sub>2</sub>O, alc., acetone, etc., of the addition compds. of hexamethylenetetramine and I, especially the tetraiodo compd., is increased by the addition of KI or other halide of an alkali metal or NH<sub>4</sub>. The materials may be made up in tablet form or in soln. The products have antiseptic and germicidal properties.

**Synthetic drugs; intermediate products.** N. NAGAI. *Brit.* 117,486, July 14, 1917. The amino alc. PhCH(OH)CHMeNH<sub>2</sub>, prep'd. by condensing benzaldehyde with nitroethane and reducing the resulting phenylnitropropanol, is converted into a mixt. of mono- and di-N-Et derivs. by treatment with an Et halide, and the product is treated with a benzoyl halide or benzoic anhydride to give a mixt. of the benzoic ester of the di-Et compd. and the N-benzoyl deriv. of the mono-Et compd.; the two products are sepd., and the N-benzoyl compd. is converted into the benzoic ester of the mono-Et compd. by treatment with HCl. The two benzoic esters can be used as local anesthetics.

**Dry stable hemoglobin preparations from defibrinated blood.** F. SCALITZER. *Holl.* 2,571, Sep. 5, 1918. After hemolysis is complete, a neutral salt not acting on the oxyhemoglobin is added to the blood to prevent freezing when it is cooled below 0°.

**Blood-forming product.** SOC. ANON. POUR L'IND. CHIM. À BALÉ. *Swed.* 44,041, May 15, 1918. Blood is allowed to flow into a coagulating medium, the mixt. is boiled with high-proof alc., the ext. is freed from the greater portion of the alc. by evapn. at a low temp., the residue is mixed with H<sub>2</sub>O, the resulting emulsion is shaken with CHCl<sub>3</sub> or other highly chlorinated hydrocarbon, and the soln. obtained is pptd. with acetone to obtain therapeutically valuable products which are finally extd. by means of ether and sepd. by evapn. *in vacuo*.

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## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**Engineering research in chemical organizations.** CROSBY FIELD. *Chem. Met. Eng.* 20, 84-5 (1918).  
E. H.

**Industrial efforts of France during the war.** GEORGES MAOUSSA. *Chem. Met. Eng.* 20, 56-8 (1919).—The coal-tar industry, production of toluene and benzene, manuf. of nitric acid and the dyestuff industry are discussed.  
E. H.

**Hydrochloric acid.** J. R. SCHULTZ. *Metal Record and Electroplater* 4, 364 (1918).—An illus. account of the modern process of manuf.  
C. G. F.

The Cottrell processes in the sulfuric acid industry. A. A. HEDMROD AND H. D. EGBERT. *Chem. Met. Eng.* 19, 309-14 (1918).—The Cottrell process is used both for cleaning the hot  $\text{SO}_2$  gases from the roasting furnaces in plants burning pyrites and other sulfide ores, and for removing and collecting acid mist in the exit gases from concentrators and absorption towers. Two forms of app. are used for the first purpose; one called the "plate" type and the other the "pipe" type. The former is used when the suspended matter in the gases is mainly dust and the temp.  $1000^\circ\text{F}$ . or more, and the latter at temps. up to  $600^\circ\text{F}$ . for the removal of fumes rather than dust. An app. used in connection with a zinc blende roaster collected 7600 lbs. material (Zn 22%, Fe 30%, Pb 2.2%, S 30%) in 24 hrs. from 17,500 cu. ft. of gas per min. at  $500^\circ\text{F}$ . The "plate" type of machine, used to purify the  $\text{SO}_2$  gases from the burning of 20-25 tons of pyrites per 24 hrs. at  $1100^\circ\text{F}$ ., yielded 900-1200 lbs. of  $\text{Fe}_2\text{O}_3$  dust per day. The "pipe" type of app. is used in the removal of acid mist. Lead and tile are employed in the interior construction of the precipitators. One installation collected 25 tons of  $40^\circ\text{Bé}$ . acid per 24 hrs. from the exit gases of a concentrator set of 22 cascade units producing 220 tons  $66^\circ\text{Bé}$ . acid per 24 hrs. 30,000 cu. ft. gas passed through the app. per min. at  $180^\circ\text{F}$ . Draft may be induced by a steam jet or a fan. In the former case the concn. of the recovered acid is low.

ISMAR GINSBERG,

Production of potash in the United States of America. ANON. *Engineering* 106, 704-5 (1918). E. H.

The potash industry of Alsace. ANON. *Engineering* 106, 734 (1918). E. H.

Perkin medal award (to Dr. Frederick G. Cottrell). Presentation address. C. F. CHANDLER. *J. Ind. Eng. Chem.* 11, 147-8 (1919). Address of acceptance. FREDERICK G. COTTRELL. *Ibid* 148-53.—Instead of reviewing the history of his process of elec. pptn., which is the subject particularly cited in the award, Dr. Cottrell spoke chiefly on the liquefaction and sepn. of the so-called permanent gases. An appreciation of Dr. Cottrell. BUCKNER SPEED. *Ibid* 153-4. Bibliography. C. F. CHANDLER. *Ibid* 154.—This bibliography covers the papers published by and patents granted to Dr. Cottrell. E. J. C.

Leaching and filtration nomenclature. A. W. ALLEN. *Eng. Mining J.* 106, 990 (1918).—The writer distinguishes between terms of similar meaning, and discusses the difference in operation between vacuum filters and filter presses. A. BUTTS.

Muscle Shoals nitrate plant (FAIRLIE) 4. Dyes and the developments of British chemical industry 25. Rational preparation of superphosphates (AITA) 15. Annual review on the various metals, metal products, ore, etc., in 1918 9. Largest potassium plant in Europe (ANON.) 20.

Precipitating titanous acid. NORSKE AKTIESELSKAB. Norw. 28,088, July 23, 1917. In mfg. fireproof compds. of Ti, solns. containing salts of Ti, Fe, and other metals are reduced by the usual methods to produce tervalent Ti, and the product is then pptd.

Magnesium chloride and carbonate. H. W. C. ANNABLE. Brit. 117,483, July 13, 1917. Mg is sepd. from a mixt. of Mg and Ca carbonates, such as decomposed dolomite, by heating the said mixed carbonates, suspended in  $\text{H}_2\text{O}$ , under pressure with the requisite amt. of Ca, Ba, or Sr chloride. The  $\text{MgCl}_2$  thus formed may then be pptd. as carbonate or as oxide which latter may be further treated in suspension with  $\text{CO}_2$  to produce carbonate or hydrated carbonate of Mg. According to the provisional specification, the heating with an alk.-earth chloride need not be conducted under pressure.

**Anhydrous magnesium chloride.** E. A. ASHCROFT. Swed. 44,299, July 3, 1918. A suitable Mg compd. is suspended, mixed, or dissolved in a fused medium in the presence of Fe or Mn or other catalyzer (and Cl is introduced?).

**Calcium carbonate.** N. STATHAM. Brit. 120,219, July 26, 1917. Light pptd. chalk having a d. of 16.2-9.5 lb. per cu. ft. is obtained by disseminating a lime liquor through an atm. contg. considerable  $\text{CO}_2$  under pressure. The pressures mentioned are 20-80 lb. per sq. in. above atm., the lighter products being obtained by the use of the high pressure. A suitable app. is specified.

**Sodium sulfite.** L. DESCAMPS. Holl. 2,256, Dec. 1, 1917. Liquid  $\text{SO}_2$  is allowed to volatilize into a mixt. of  $\text{H}_2\text{O}$  and Zn dust, producing a cooling effect. After the reaction is complete NaOH of 45-50° Bé. is added to sep. the Zn with the minimum content of  $\text{H}_2\text{O}$ . The Zn is then completely sepd. by the addition of  $\text{Na}_2\text{CO}_3$ .

**Sodium cyanide.** H. P. EASTMAN. Can. 188,259, Jan. 14, 1919. An alk. earth cyanamide is caused to react with an alkali metal chloride above the m. p. of the latter and in the presence of  $\text{CaC}_2$ . The  $\text{CaC}_2$  prevents foaming and hastens the reaction. Cf. C. A. 13, 166.

**Treating zinc salt solutions.** P. FERRÈRE. Swed. 44,062, May 15, 1918. In the prepn. of ZnO from  $\text{ZnSO}_4$  soln. as an intermediate product, the soln. of the Zn salt (such as  $\text{ZnSO}_4$ ) is satd. with  $\text{SO}_2$  and the oxide of alk.-earth metal is added in amt. less than necessary to combine with half the  $\text{SO}_2$  present, and the  $\text{SO}_2$  is then added continuously, without pressure, together with the alk.-earth oxide, in the stated proportions, until all the Zn is present as dissolved  $\text{ZnSO}_4$ .

**Alumina free from iron.** NORSKE AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI. Norw. 28,901, Aug. 5, 1918.  $\text{Al}(\text{OH})_3$  is pptd. from Al minerals and salts by means of sol. sulfide. The addition of the sulfide is discontinued upon the appearance of black  $\text{FeS}$ .

**Nitrogen from air.** ELEKTRISITÄTSWERK LONZA. Norw. 28,962, July 29, 1918. Air is forced, in counter-current, through solns. of  $(\text{NH}_4)_2\text{SO}_4$  until the O content of the air is reduced to 1%.

**Fixation of nitrogen.** R. M. MCKEE. Can. 188,363, Jan. 21, 1919. A container having exposed interior walls of an alloy of approx. Ni 60%, Cr 12%, Fe 25%, is used in the N-fixation process. The container is durable and resistant and seems to act as a catalyzer.

**Decanting and settling chemical and other liquids.** W. CLIFFORD and JONES & ARWOOD. Brit. 117,472, May 24, 1917. In the sepn. and settlement of suspended matters from chem. and like mfg. liquids, providing at or near the top of the settlement tank a bucket or like vessel by which the liquid from the inlet is directed in an upward direction into a relatively large body of liquid within an open-bottomed guard chamber or well which directs the slowly moving liquid downward into the body of the liquid in the tank. In a modification, the bucket or like vessel is replaced by a funnel-shaped vessel carried at the end of the inlet pipe and adapted to direct the flow upwards.

**Recovering liquids used for separating solids of different specific gravities.** A. NAGELVOORT. Can. 188,397, Jan. 21, 1919. The sepd. solids are washed in a solvent of the separating medium which will not chemically react or combine therewith except to form the soln.  $\text{SnBr}_2$  is removed from solids by washing in liquid  $\text{CS}_2$ . Cf. C. A. 12, 129.

**Separating solids of different specific gravities.** ADRIAAN NAGELVOORT. Can. 21, 1919. Solids of different sp. gr. are sepd. in a soln. of a bromide and  $\text{CS}_2$ , then the solids are washed with  $\text{CS}_2$  and the excess  $\text{CS}_2$  required to provide a separating medium of the desired sp. gr. is distd. off from the resulting soln. Cf. C. A. 12, 129.

**Molded blocks of nitrides.** E. PODSZUS. *Holl.* 2,517, Oct. 1, 1918. In the manuf. of molded blocks of BN or TiN, the metals or their compds. are molded, sintered by heating, and then heated in an atm. of  $\text{NH}_3$  or the like to convert them into the nitrides.

**Platinizing pottery, etc.** F. J. KETTEL, A. GASCH and T. A. DEAN. *Brit.* 117,432, May 13, 1918. The article is covered with a soln. or emulsion consisting of  $\text{PtCl}_4$ , glycerol, and phenylhydrazine, heated to  $850\text{--}900^\circ$  to reduce the Pt to the metallic state and subsequently cooled gradually under ordinary atm. conditions. The ingredients are used substantially in the proportions of 3 g. of  $\text{PtCl}_4$  to 12 cc. of glycerol and 7 drops of phenylhydrazine. In prepg. the soln. or emulsion, the  $\text{PtCl}_4$  is dissolved in the least possible quantity of  $\text{H}_2\text{O}$ , the glycerol is added, and the mixt. is heated on a water-bath until it reaches the temp. of boiling  $\text{H}_2\text{O}$ , at which it is maintained for 1.5 hr.; the phenylhydrazine is then added slowly drop by drop and the mixt. stirred. Heating is continued until frothing ceases, *i. e.*, about 3 hrs.; or the liquid may be poured away from the froth.

**Fireproof and acid proof products.** TITAN CO. *Norw.* 29,010, Aug. 12, 1918. Ti acid and alkali hydroxide, with or without other substances, are heated to partial sintering.

**Vegetable glue.** C. BERGQUIST. U. S. 1,287,841, Dec. 17. An adhesive is formed of starch and  $(\text{CH}_3)_4\text{N}_4$ . On drying the adhesive gives a clear film.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**Scientific glassware.** MORRIS W. TRAVERS. *Nature* 102, 265-6(1918).—A review of the development of scientific glassware manuf. in Great Britain with a discussion of the future possibilities of the industry. Cf. *C. A.* 12, 2419.

W. H. ROSS.

**The British scientific-glass industry.** ANON. *J. Soc. Chem. Ind.* 37, 450R(1918).  
E. H.

**Design of transmission line porcelain insulators.** G. I. GILCHRIST AND T. A. KLINEFELTER. *Elec. J.* 16, 8-16(1919); illus.; cf. *C. A.* 13, 210.—The main causes for porcelain insulator failures are: improper distribution of dielec. field and of surface leakage; porosity; mechanical breakage; lightning; birds short-circuiting the line; unequal expansion of metal, cement, and porcelain; internal stresses in the material; and defective batches. Several old types and a new type of insulator are illustrated and discussed. The proposed type embodies: a surface conforming to the flow lines of the electrostatic field; rain-shed surface conforming to the equipotential surfaces; lines of mechanical stress parallel to the electrostatic flow lines; leakage resistance per shell about equal; and approx. equal capacity per shell. From a dielec. standpoint, a special cap appears desirable, but voltage characteristics under rain are the same whether for this or the line and tie wire, and cost and ease of replacement, cost of construction, etc., favor the line and tie wire construction. Advantages claimed for the new type of insulator are: When dry the corona and static formations are practically limited to the tie wire and line wire up to flashover voltage; when wet no corona or static formation occurs; leakage resistance per shell is increased gradually from the head to the center shell; voltage distribution per shell is equal when clean and in dry air; voltage distribution per shell is approx. equal under all operating conditions; it has high resistance to side pull for a given weight and given elec. strength (due to coincidence of flow line of electrostatic field and the mechanical stress lines); individual shell design is such that

when tested before assembly the surface conforms to the electrostatic flow lines; shape of individual parts and of assembled units affords protection from mechanical breakage and from complete failure during flashover in service; and each characteristic of the insulator affecting durability is treated uniformly throughout the line.

W. H. BOYNTON.

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Silicate specific heats (WHITE) 2.

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Glass blowing apparatus. THE OWENS BATTLE MACHINE CO. Can. 188,278, Jan. 14, 1919.

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## 20. CEMENT AND OTHER BUILDING MATERIALS.

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C. N. WILEY.

Dalen portland cement mills, Brevik (Norway). Largest potassium plant in Europe. *Farmand* 1918, No. 48.—The Dalen portland cement Mills, Brevik, Norway, will start mfg. cement Jan., 1919, and the company has a plant under erection for mfg. K salts for fertilizers as a by-product. The method used for obtaining the K is the one now in use in the American portland cement industry. The capacity of the plant is 150,000 tons cement and 25,000 tons K fertilizer yearly. G. HALLBERG.

Antiseptic treatment of timber. R. S. PEARSON. Calcutta. *Indian Forest Records* 6, Part 4, 128 pp.(1918).—Detailed data are given showing results of lab. and field tests of 12 different species of Indian woods when variously treated in open tanks and under pressure with 25 different salts and oils or combinations of these. Woods of all degrees of hardness were employed in order to det. their suitability chiefly for railroad ties, but also for fence posts, telephone poles, mine props, etc. Best results were obtained with various coal-tar creosotes. Solns. of various salts are not so serviceable in the wet climate where tests were made, but might be serviceable in the more arid localities. The treated hard and moderately hard woods as compared with untreated specimens stood up better in proportion than treated soft woods. C. O. EWING.

Typical specifications for non-bituminous road materials. PREVOST HUBBARD AND F. H. JACKSON. U. S. Dept. Agr., *Bull.* 704, 40 pp.(1918).—The various sizes broken stone products are given which may be used satisfactorily in constructing various types of roads. The forms of specifications adopted for non-bituminous road material are in general those recommended by the First Conference of State Highway Testing Engineers and Chemists (U. S. Dept. Agr., *Bull.* 555). J. J. SKINNER.

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Non-bituminous road materials (REINECKE) 8.

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Acid-resisting cement. A. E. HOLLEY and H. W. WEBB. U. S. 1,287,995, Dec. 17. An acid-resisting cement adapted for use in building chimneys or tanks is formed of sand 7,  $\text{CaSO}_4$  0.12, a 60° Tw. Na silicate soln. 3, ground stoneware 8 and ground blue brick 2 parts.

Acid-resisting cement. A. E. HOLLEY and H. W. WEBB. U. S. 1,288,413, Dec. 17. An acid-resisting cement suitable for use in building chimneys or tanks is formed of finely ground stoneware 8, sand 7, finely ground blue brick 2,  $\text{PbCO}_3$  0.5, and Na silicate soln. (60° Tw.) 3 parts.

Hydraulic cement and alkali manufacture. PATENTAKTIEBOLAGET JUNGNER'S KALI-CEMENT. Brit. 117,460, July 11, 1918. In the manuf. of cement and alkali from feldspar or other alkaliferous silicate minerals and lime or substance contg. lime,



the mixt. is first heated by means of fuel to such a temp. that the  $\text{CO}_2$  is driven off and the calcined mixt. is then introduced into an elec. furnace in which the heating is continued until cement is formed and the alkali driven off as vapor which is condensed and collected. The first heating may be conducted in a rotary furnace up to  $900^\circ$ , and the second heating in an elec. resistance or radiating furnace up to  $1400^\circ$  or higher. A suitable elec. resistance furnace comprizes a receptacle mounted on trunnions and lined with fireproof clay and containing a number of vertical plates of elec. conducting material such as C or graphite and sepd. by rectangular sticks of C and non-conducting pieces alternately. Screws are provided for holding the plates in contact with the sticks. Condensation of the alkali may be obtained on the furnace cover or in a cooled chamber connected by a pipe with the furnace interior. The deposition may take place in  $\text{CO}_2$  or an atm., such as the flue gases from the calcining chamber, containing  $\text{CO}_2$ .

**Concrete.** W. J. STEWART. Brit. 117,504, July 25, 1917. Concretes of low sp. gr. are formed by firing molded elements of a shapable material such as vitreous clay, or non-vitreous clay subsequently receiving a vitreous coating and sanding. The aggregate is prepd. by molding clay in uniform molds, e. g., of spherical form, burning, glazing to render non-absorbent, and causing sand to adhere to the glaze before cooling to produce a rough surface. Such aggregates, in differing forms and sizes, from a quarter to three-quarters of an in. in diam., are employed with sand and lime to constitute concretes, which if they are to be molded, may have the aggregate elements systematically arranged according to size in the mold. The matrix material, such as cement, is caused to flow in from below upwards preferably under pressure so as to displace air and obviate bubbles.

**Concrete.** C. E. BARGLEBAUGH. U. S. 1,287,827, Dec. 17. A concrete mixt. is formed of cement 1, ground lava rock (100 mesh) 1.5 and aggregate (about 1 in. diam.) 3 parts. The concrete is relatively light and is stated to be waterproof.

**Soluble potassium compounds from cement-mill dust.** A. R. MERZ. U. S. 1,288,437, Dec. 17. Portland cement mill dust is ignited in an oxidizing atm. to increase its  $\text{H}_2\text{O}$ -sol. potash content. The pat. is dedicated to the public for free use.

**Composite building material.** E. VIENS. Can. 187,899, Dec. 10, 1918. A fireproof, resilient building material composed of portland cement, asbestos fiber,  $\text{Ca}(\text{OH})_2$ , sawdust and siliceous material requires a force of 450 pounds to pull therefrom a 2-inch nail driven 1.5 inches therein.

**Tarred paper.** R. P. PERRY. U. S. 1,288,158, Dec. 17. A material suitable for use as roofing or sheathing is formed of superposed sheets of paper which contain different proportions of bituminous material.

**Tarred felt.** R. P. PERRY. U. S. 1,288,159, Dec. 17. Finely divided asbestos or other fibrous material is added to comminuted pitch, asphalt or other bituminous substance and while the mixt. is in soft adherent condition it is pressed into sheet form.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Fuels and their uses.** VERSEFUY. *J. des usines à gas*, Aug. 20, 1917; *Het Gas* 38, 126-31 (1918).—A lecture. JULIAN F. SMITH.

**Methods for more efficiently utilizing our fuel resources.** C. G. GILBERT AND J. E. POGUE. *Gen. Elec. Rev.* 22, 72-81 (1919); cf. *C. A.* 12, 1241, 2683.—The wastefulness of burning raw coal is condemned and strong recommendation is made that the coal products industry be expanded to furnish a greater amount of prepared fuel in both solid and gaseous states. Details are given. C. G. F.

**Recent methods for the study of the chemical composition of coal.** A. MAILHE. Toulouse. *J. des usines à gaz*, Aug. 5 and 20 and Sept. 5, 1917; *Hel Gas* 38, 151-5, 177-82 (1918).—A lecture. JULIAN F. SMITH.

**Calorific values and ash yields of coal samples.** T. J. DRAKELY. *Gas World* 69 (Coking and By-products Sec.), No. 1789, 21 (1918).—A study of the influence of impurities upon the calorific value of coal. Samples of the same thoroughly dried and crushed coal were taken and the ash content varied; the calorific value being detd. in a Mahler-Cook bomb calorimeter. In order to effect complete combustion of the mixts. which contained only small amts. of coal, sufficient pure naphthalene was mixed therewith to give approx. the same rise in temp. as with the coal samples, the heat due to the combustion of the naphthalene being deducted from the total. With a total ash content of 3.38% the calorific value was 14,191 B. t. u.; with 13.89%, 11,346; with 24.44%, 8,520; with 34.95%, 5,675; with 45.46%, 2,821; zero calorific value was reached with 56% of ash. Tests with other coals showed the same general calorific decline with upward ascent of the % of ash. In the purchase of coal according to specifications, it is usual to correct the price for variations in calorific value and ash and moisture content. It might be argued, from the results of the test, that the ash content adjustment of the price was unnecessary, as it incidentally forms the basis of the calorific value correction. However, in boiler practice, it was found that the increase in evapn. observed with a cleaner sample of the same coal was not directly proportional to the decrease in the amt. of inert matter in the coal. Hence the correction of price according to the variations in the % of ash as well as calorific value is essential when coal is bought for industrial purposes on a specific basis. J. L. WILBY.

**Selecting coal for power plant use.** ROBERT JUNE. *Elec. Rev.* 74, 94-7 (1919).—This article points out the characteristics of various coals, and the influence of coal upon furnace-chamber proportions. Numerous curves and tables are included.

C. G. F.

**Coal conservation in relation to gas manufacture.** TIM DUXBURY. *Gas J.* 144, 302-8 (1918); *Gas World* 69, 262-3 (1918).—Results of further tests on steaming in Dempster-Toogood vertical retorts in which the objective was coal conservation. If the results as given hold good, 30,000 tons of coal will be saved annually. The make of gas per ton of coal from the March to Sept. quarter shows an increase of about 80% with a decrease in the calorific value of only 22%. The gas is now of 450 B. t. u. and the lighting effect is better than from 600 B. t. u. gas. On a B. t. u. basis the efficiency is also greater for gas heaters. About 22,000 cu. ft. of gas is being produced per ton of coal, and the coke yield is remarkably high, 14.5 cwt. More tar and NH<sub>3</sub> are being produced; the latter is weaker, probably due to the use of too much steam in steaming. The gas is also more free from S than previously.

J. L. WILBY.

**Briquetting small coal, coke breeze and coal washery slimes.** J. A. YEADON. *Gas World* 69 (Coking and By-products Sec.), No. 1789, 21-2 (1918).—A profitable method of utilizing coal and coke wastes by the manuf. of small ovoid briquets for domestic use, pitch being the most suitable binder. In the ovoid form, the smallest sizes and the most inferior qualities of coal even when containing as much as 20% of ash and 10% of moisture, can be profitably utilized. Coke breeze alone can be used with 8% of pitch.

J. L. W.

**Experiments in the distillation of heath sod.** ANON. *J. des usines à gaz*, Oct. 5, 1917; *Hel Gas* 38, 161 (1918).—A yield of 23.78% gas and 22.84% charcoal (calcd. from the gross wt. as delivered to the works) was obtained by distg. heath sod. The gas is of good enough quality to be mixed in equal proportions with coal gas. The charcoal is of good quality, bringing 25 to 30% better prices than pine charcoal.

JULIAN F. SMITH.

**Low-temperature carbonization and its products.** F. MOLLWO PERKIN. *Gas World* 69, 385-6(1918); *Engineering* 106, 746-7(1918).—A discussion presented before the Institution of Petroleum Technologists, on how best to utilize the various sources of oil in shales, poor coal, lignite, peat, etc. The character and quality of the products obtained by the carbonization of bituminous minerals depends mainly upon the temp. and the character of the raw material. On the whole, however, low temp. yields olefins and paraffins, and high temp. aromatic hydrocarbons. In horizontal retorts the av. temp. is 1100°; in vertical retorts, 1300-1400°. The main products of low-temp. and high-temp. carbonization, resp., are as follows: gas 5000-12000 cu. ft. per ton of coal, the latter being richer in H;  $(\text{NH}_4)_2\text{SO}_4$ , 10-20 lbs.; tar or crude oil 20-11 gals., in rich cannels it may rise to 60 gals. Financial success of low-temp. practice is possible on 3 lines: (1) by production of oil and smokeless fuel; (2) by production of oil and conversion of the fuel residue into power gas; (3) by production of oil, using a portion of the residue as domestic fuel and gasifying the remainder. Some comparative analyses are made of the products obtained by the Tarless Fuel Syndicate, carbonizing at 500° and by another company working with Glover-West retorts at about 1400°: coke, volatile matter 9.87-1.31%, fixed C 74.5-86.9, ashes 12.59-9.27, N 2-1.5, gas per ton 128,000-175,000 cu. ft., B. t. u. 139-132,  $(\text{NH}_4)_2\text{SO}_4$  101-23 lbs. Statistics are given in regard to shale distn., which is primarily a low-temp. operation. Another source of oil is lignite, which on distn. yielded 33-35 gals. of crude oil per ton, the coke proving satisfactory in a suction gas plant. With regard to peat, the greatest trouble was drying. By distg. Scottish peat containing 14.6% moisture and 53.5% volatile matter with superheated steam right down to C, there were obtained 1.9 gals. of spirit, 13.8 gals. fuel oil, 1.6 gals. phenols, 50 lbs. retort C, 2.5 gals. wood spirit, 23.8 lbs. acetate of lime and 8 lbs.  $(\text{NH}_4)_2\text{SO}_4$ . Also in *Gas J.* 144, 658-60(1918). J. L. WILEY.

**Report of the gas investigation committee to the Institution of Gas Engineers.** ARTHUR SMITHHELLS, *et al.* *Gas J.* 144, 235-49, 291-9(1918).—Three important domestic applications of gas through the ring-burner, the incandescent upright mantle burner, and the gas heater, are discussed. In the ring-burner tests various kinds of gases ranging from 530 to 241 B. t. u. were used. The consumption per hr. was 14-31 cu. ft. The conclusions from this test in boiling water are that flame contact is essential for high efficiency and that the efficiency is almost independent of the rate at which the gas is burned, between the limits of 10 and 25 cu. ft. per hr., also that efficiency is practically independent of compn., inerts or calorific value, but to deliver a sufficient number of B. t. u. in a reasonable time without abnormal pressures the gas used should be of moderately high calorific value. The efficiency of ring-burners varies considerably with the type; lighting back occurred with some burners with gas of 400-500 B. t. u. However, a wide variation in grade or compn. of gas can be made without impairing the efficiency of ring-burners now in use. In the lighting tests various kinds and qualities of gas ranging from 615 to 314 B. t. u. were used. The variations obtained from the richest to the poorest gas were: B. t. u. per cu. ft. of gas and air mixt. before burning, 88.2-86.1; per cu. ft. of combustion products, 91.9-97.2; cu. ft. of gas consumed per hr., 4.5-7.3; candles per cu. ft. at point of max. efficiency, 14.8-6.8. It was found important that the zone of active combustion be made to fit closely the mantle by either varying the gas consumption or the degree of aeration. This was found difficult with gases below 450 B. t. u. and about 600 B. t. u. The influence of inerts on gas of low calorific value was marked, but was negligible with medium heat values, the max. illumination being found at 525 B. t. u. The results show no preference for rich gas, rather the contrary. The gas heaters were measured by their radiation efficiency. The evidence obtained points to the conclusion that a difference in the grade or compn. of the gas supplied, within wide limits, does not cause any considerable

difference in the radiant efficiency of a gas fire, provided that the mechanical construction will allow sufficient gas to be passed, so that the same number of B. t. u. per hr. can be supplied. Also in *Gas World* 70, 53-4 (1919). J. L. WILBY.

Report of the forty-sixth general meeting of the Netherlands Association of Gas Manufacturers. *Het Gas* 38, No. 11a, 104 pp.—This report contains, aside from the proceedings of the discussions incident to the meeting, 3 addresses of a technical nature which do not seem to contain anything new: The washing of benzene in gas plants. G. F. VAN LIMBROCH VAN DER MEERSCH. Amsterdam (pp. 44-7). Old and new methods for the preparation of ammonia. ALPH. STEGER. The Hague (pp. 49-57). The analysis of coal tar according to the requirements of the Imperial Bureau of Coal Distribution. F. VAN OOSTROM MEIJES (pp. 60-2). JULIAN F. SMITH.

Some observations concerning (A) liquid purification of, and (B) simultaneous recovery of sulfur and ammonia from coal gas. P. PARRISH. *Gas J.* 144, 413-20 (1918); *Gas World* 69, 300-4 (1918).—The process of liquid purification contemplates the complete purification of gas by effecting the combination of the acid and alk. impurities to form salts which are readily sol. in water or weak ammoniacal solns. in circulation in a series of suitable towers. Since the acid impurities preponderate,  $\text{NH}_3$  must be added to obtain the necessary combination. Four operations are involved: (1) purification of the gas, (2) dissociation of the  $\text{NH}_3$  compds. in order to remove the acid gases from the foul liquor, (3) distn. of the purified liquor with production of  $\text{NH}_3$ , which is used in the scrubbers, (4) utilization of the acid gases by combustion for the production of  $\text{SO}_2$  and later  $\text{H}_2\text{SO}_4$ , or recovery of the  $\text{H}_2\text{S}$  as Claus S. From equations and data given, it is seen that there must be removed per ton of coal 13 lbs.  $\text{H}_2\text{S}$ , 30.6 lbs.  $\text{CO}_2$ , 0.74 lb.  $\text{CS}_2$  and 1.67 lbs.  $\text{HCN}$ . To effect this removal 38.08 lbs.  $\text{NH}_3$  will be required, or 5.07 times the quantity of  $\text{NH}_3$  in the gas, taking as a basis 30 lbs. of 25%  $(\text{NH}_4)_2\text{SO}_4$  or 7.5 lbs.  $\text{NH}_3$  per ton of coal. In addition to this, P. recommends circulating 7 times as much  $\text{NH}_3$  as is available in the gas in order to establish a reserve against variations. Besides this disadvantage and source of loss, there is mentioned another in connection with the distg. plant which, as is shown, must deal with a quantity of over 80,000 gals. per day of 1.39%  $\text{NH}_3$  liquor, and this from only a 250-ton per day plant. The details of design and arrangement of plant are given. It is calcd. that the capital cost of the plant would be no more than for a series of purifiers for dry purification, nor would there be very much difference in the cost of liquid and solid purification with the advantage that the former is more complete. A brief description is given of each the Claus and Burkheiser processes for recovering the  $\text{SO}_2$  as  $\text{H}_2\text{SO}_4$ . J. L. WILBY.

Review of the preliminary working tests of Settle's downward-steaming process for intermittent vertical retorts. ANON. *Gas J.* 144, 256-8 (1918).—Excellent results have been obtained in a series of tests carried out at the Truro Gas Works on a process devised by Thomas Settle for the downward steaming of intermittent vertical retorts. The additions to the retorts required to work the process comprize superheating coils and steam supplies on the top of the setting, and valve-controlled connections between the bottoms of the retorts. The steam at 30 lbs. pressure and superheated to 300° F., is admitted at the top of the retort through a circular knife-edge aperture 0.25 in. in diam. in a disk fitted into the steam pipe and thence into a clear place of about 2 ft. in the retort above the charge. Its velocity is repeatedly checked, its temp. is further raised, and instead of impinging on the incandescent coke at a high velocity that favors by-passing through any fissure in the charge, it approaches at a slow speed in a compact body equally diffused over the entire area. Steam is turned into each charge in succession, over the last quarter of a 12-hr. period, travels downward to the bottom connection, and thence to the base of a fresh charge, through which it travels upward to

the gas outlet. Thus, each charge receives 3 hrs. steaming down and 3 hrs. blue gas up. The advantage of the highly heated upward current of blue gas is a diln. of the rich gases without absorption and loss of heat, and protection of them from decompn. Consequently, the pitch in the tar falls below 40% and the yield of  $\text{NH}_3$  rises 30%. There is a remarkable decrease in the temp. of the gases at the exit, an av. of  $130^\circ \text{F.}$  being found, proving that the "dew-point" has been brought back from the usual position, somewhere in the foul main or close up to the interior of the retort. This effectively prevents deposits of  $\text{NH}_4$  salts in the hydraulic main. The steam in its descent and its conversion washes out the residual gases from the coke, and the diffusion of the blue gas in the freshly charged retort creates a new atmosphere inside the retort which is worthy of further study. The high proportion of H and  $\text{CH}_4$ , and the low content of CO, indicate new conditions. A fair sample of the gas shows in %:  $\text{CO}_2$  2,  $\text{O}_2$  0.7, CH 3.5, CO 4.8,  $\text{CH}_4$  32.1,  $\text{H}_2$  48.7,  $\text{N}_2$  8.2. The objective was a uniform 500 B. t. u. gas; it was found possible to keep within the limits of + or - 10 B. t. u. and to produce 10 million B. t. u. per ton of coal, or 20,000 cu. ft. of gas, with 12 gals. of tar oils and 30 lbs.  $(\text{NH}_4)_2\text{SO}_4$ . There is real economy here in the saving of about 25% of coal, as formerly about 14,000 cu. ft. of gas were made. The temp. of the charge during down-steaming ranged from  $1000^\circ$  at the bottom to  $800^\circ$  at the top. The loss of weight of coke due to the use of steam was 2.34%. The av. temps. in the settings outside the retorts were: bottom zone  $1330^\circ$ , middle  $1170^\circ$ , top  $1120^\circ$ . The process is applicable to any large-scale installation of intermittent vertical retorts or on small gas works.

J. L. WILBY.

**Economizing coal in gas manufacture.** FREDERICK SHEWRING. *Gas World* 69, 261(1918).—A suggestion for conserving coal by means of steaming the charges in horizontal retorts for production of blue water-gas.

J. L. WILBY.

**Steaming horizontals at Leek.** R. H. GINMAN. *Gas World* 69, 263-4(1918).—Av. working results show a yield of 16,200 cu. ft. of 490 B. t. u. gas per ton of coal. Eight hr. charges are being worked, yielding per ton: tar 14 gals. sp. gr., 1.14;  $\text{NH}_3$  liquor, 48.7 gals.; coke, 9 cwt. The compn. of the gas in % is: H 50.4,  $\text{CH}_4$  22.6, unsatd. hydrocarbons 2.9, CO 10.6,  $\text{O}_2$  0.8,  $\text{CO}_2$  5.2, N 7.5. A saving of 514 tons of coal was made in Aug. and Sept., 1918.

J. L. WILBY.

**Steaming in horizontal retorts.** JAMES K. LAW. *Gas J.* 144, 425(1918).—Steaming expts. have resulted in a saving of about 22% of coal, with a gas yield of 14,470 cu. ft. per ton of coal. The advantages are: the removal of the necessity of scurfing the retorts and cleaning the pipes; the quality and quantity of coke is as great as before; the tar, liquor and other residuals are unaffected; while the quality of the gas is very satisfactory.

J. L. WILBY.

**Labor-saving removal of clinker from gas furnaces.** G. FRÈRE. *Gas J.* 144, 469(1918).—The principle of the method is simply the removal of the ash as it is formed in the producer, which is required to have vertical walls. The result is attained by the use of a horizontal grid consisting of square Fe bars placed 1-1.25 in. apart. These bars are bent over at each end, and rest at the back of the furnace in a cast-Fe setting of ratchet formation; the space between each 2 teeth serving as the seat for the bar. The other end of each bar projects from the front of the producer below the door by which the declinkering is done. Here the bars rest in recessed parts of a plate attached to the front of the furnace by pins, and divided horizontally into 2 parts for ease of removal. The end of each bar projecting through the plate is fitted with a small rod, connected to a common lever, which is set in motion at suitable intervals by a motor. The lever is adjusted so as to give 6-10 quarter turns within a few secs., thus dislodging the ash which cannot collect in sufficient quantities to form large masses of

clinker customary in gas producers. The process may be promoted by the constant delivery under the grid of from 5-600 g. of steam per kg. of coke, the steam having no effect on the efficiency of the producer.

J. L. WILEY.

**Modern water-tube boilers in gas works.** E. DAVIES. *Gas J.* 144, 509(1918).—Some minor innovations in water-tube boilers for supplying steam to blue water-gas plants.

J. L. WILEY.

**"Pleno" gas.** D. STAVORINUS. Amsterdam. *Het Gas* 38, 155-60(1918).—The name "Pleno" gas was applied by Helps (*C. A.* 12, 1246). It is a gas dild. to a heat value of about 3000 cal. per cu. m., according to Brit. patent 111,495 (*C. A.* 12, 992). The importance of this type of gas is in the widespread effort to obtain the right to supply gas of low heat value in cities. Gas yielding as low as 3600 cal. per cu. m., can be used in appliances now in use, by proper regulation. While the vol. consumed is higher, the number of cal. required is lower than for a richer gas, and thus the useful effect is greater.

JULIAN F. SMITH.

**Manufacture of gas from wood and peat.** E. ORT. Zürich. *J. Gasbel*, Nov. 17, 1917; *Het Gas* 38, 103-8(1918); cf. *C. A.* 12, 860.—Wood and peat differ from coal and crude oil in the high moisture content (in peat sometimes as high as 90%). For making gas, they should be at least as dry as ordinary air (about 20% moisture). Above about 280° the carbonization of wood is exothermic. Consisting mostly of cellulose and lignite, wood and peat have a high O content and low calorific value. Most of the O comes off as CO<sub>2</sub> and CO, so that the gas contains 20 to 30% of each of these constituents. It contains only about 15% of CH<sub>4</sub> and 5% of heavy hydrocarbons. While it is theoretically possible to increase the heat value by passing the gas over glowing charcoal to reduce CO<sub>2</sub> to CO, in practice there is as much loss by decompn. of hydrocarbons as gain by formation of CO. By passing the crude gas, containing tar and steam, over glowing charcoal, some water gas is obtained; but even this method does not enrich the gas sufficiently to be practicable. Better results can be obtained simply by distg. well dried material in horizontal or inclined retorts not more than half filled. If each charge is drenched with tar from preceding charges, the yield of hydrocarbons is somewhat increased. The CO<sub>2</sub> can be removed by dissolving in H<sub>2</sub>O under pressure, or by absorption in lime water. The coke from peat is friable and has little value. The results obtained from peat vary a great deal more than those from wood.

JULIAN F. SMITH.

**The efficiency of gases of various composition in boiling experiments.** J. P. WIBAUT AND H. DE LEEUW. Amsterdam. *Het Gas* 38, 225-8(1918); *Chem. Weekblad* 15, 1278-9.—The efficiency of various gases of high and of low calorific value was tested by the method of heating a known amt. of H<sub>2</sub>O to boiling. The poorest gases have the lowest efficiency, but the difference is relatively slight. Thus, a coal gas and a water gas, differing 40% in calorific value, differed only 6% in efficiency.

J. F. SMITH.

**Energy losses.** J. RUTTEN. THE HAGUE. *Het Gas* 38, 279-82(1918).—A discussion of energy losses in gas works, and how to attain and maintain high working efficiency.

JULIAN F. SMITH.

**Increasing the concentration of ammonia liquor.** J. RUTTEN. The Hague. *Het Gas* 38, 282-3(1918).—The method of washing NH<sub>3</sub> from gas by washing first with dil. liquor and then with H<sub>2</sub>O must be used with caution, since careful control is required. The procedure for a rotary washer should be to det. the strength of the liquor in each compartment, and the content of volatile NH<sub>3</sub>; make the same detns. in the weak liquor to be used; and add it to that compartment in which it will yield a stronger liquor. The Baumé is not sufficient for detg. volatile NH<sub>3</sub>; it must be detd. directly.

JULIAN F. SMITH.

**Benzene as a motor fuel.** S. E. WHITEHEAD. *Gas J.* 144, 615-6(1918).—The four requirements for a suitable motor fuel are: (1) Easy starting from cold; (2) absence of objectionable odor, both in the fuel itself and in the exhaust, and no liability to cause excessive corrosion of any part of the engine; (3) no liability to form deposits in the cylinders and valve passages; (4) economical consumption. Benzene starts from the cold less easily than gasoline on account of its much lower vapor pressure. This can be overcome by adding a sufficient amt. of gasoline or of  $C_2H_2$ . Com. 50/90 benzene will not freeze above  $-10^{\circ}$  C. and the addition of a small proportion of gasoline considerably reduces the f. p. The question of odor depends upon (a) completeness of combustion; and (b) S content of the fuel. (a) is controlled by the proper adjustment of air supply. Gasoline contains on an av. 0.05% or 25 grains per gal. of S, whereas an av. 65's crude benzene contains up to 1% each of  $CS_2$  and  $C_4H_4S$ . The bulk of the  $CS_2$  is removed in the forerunnings; and the  $C_4H_4S$  can be very easily reduced by thorough washing with  $H_2SO_4$ , or by the chlorination process of Dutt and Hamer (*C. A.* 12, 2683). By these means a rectified product can be obtained containing 0.1%  $CS_2$  and 0.2%  $C_4H_4S$ , or a total S content of 90-95 grains per gal. Tests on coke-oven benzene, containing varying amts. of S, showed that the S in benzene need not be feared either as a source of objectionable odor or as a cause of corrosion of the engine. Deposits are of 2 kinds—C resulting from incomplete combustion, and resinous matter formed by polymerization of hydrocarbons. The former can be avoided by proper adjustment of the air supply, the latter by proper refining of the crude benzene to remove such products as cyclo- and dicyclopentadiene and coumarone which are readily oxidized to resins. Benzene is more economical both in power output per gal. and thermal efficiency of the engine. Tests show that benzene, used on gasoline engines under similar conditions of compression, etc., gives 10-20% more power and 20% more mileage per gal. than gasoline. The thermal efficiency and power output of the engine may be further increased by increasing the compression; compressions of 150-160 lbs. may be employed without danger of preignition. Benzene offers also other advantages. The explosive range of mixts. of benzene vapor and air is nearly twice that of gasoline; consequently troubles from too weak or too rich a mixt. are considerably reduced. The rate of combustion of a benzene mixt. is less than of the gasoline mixt.; this results in the elimination of knocking in an engine running at low speed. The higher flash-point of benzene makes it safer in handling and transport. Since benzene and alc. are miscible in all proportions, and gasoline and alcohol are not, another source of good fuel is made available in case gasoline production decreases. There is now used very successfully on the Continent a mixt. of 80 l. 95% alc., 20 l. benzene, and 200 g. naphthalene.

J. L. WILEY.

**Future of benzene.** D. R. WATTLEWORTH. *Gas World* 69, 345(1918); *Am. Gas Eng. J.* 109, 588(1918).—The article deals with the use of benzene as motor fuel. The usual complaints of gumming, corroding, freezing and water are discussed and the customary remedies suggested.

J. L. WILEY.

**Washing light oil fractions from coke-oven gas.** F. D. SCHREIBER. *Gas Age* 43, 22-4(1919).—Details of a practical and economical method used at the Koppers plant of the Brier Hill Steel Co., Youngstown, Ohio, for washing the crude light oil fractions. After the usual acid wash, lime is used in place of caustic as the neutralizing agent. For washing benzene there is used to each 5000 gal. charge 25-40 lbs. lime containing about 97% active  $CaO$ . The lime is slaked with a small amt. of water several hrs. before using, and when ready for use is mixed with 75 gals. of water. This is then added to the agitator and stirred for 30 mins. The unused lime and  $CaSO_4$  are drained off together with the water added, and then the charge is washed down with 100 gals. of water. Sometimes it is necessary in order to neutralize the last traces

of acid to use 5-8 gals. of NaOH of strength 80-90 g. per l. If care is used in making these washes very good results will be obtained. The acid consumption will vary between 0.4-0.45 lb. per gal. of crude product and the loss will be not over 3.5% by vol. of the benzene charged. For washing toluene 75-100 lbs. of lime are required to neutralize the large amt. of acid which is mechanically held by the toluene. The acid consumption should not exceed 0.2-0.25 lb. per gal. of crude product, and the loss can be easily kept under 1%. For washing solvent naphtha 75 and 50 lbs. of lime are added at different times. The acid consumption should not exceed 0.25 lb. of product washed, and the loss not over 8%.  
J. L. WILEY.

Coke plant producing gas for domestic use. ANON. *Gas Age* 43, 11-2(1919).—A good example of by-product coking practice in connection with supplying a local demand of both gas and coke. The plant is the Minnesota By-product Coke Co., situated in St. Paul. The plant consists of 65 Koppers cross-regenerative 12.25-ton ovens with a capacity of 1100-1150 tons of coal per day, and is complete for the recovery of gas, tar,  $\text{NH}_3$  and benzene. It produces 6 million cu. ft. of city gas per day, 9 gals. tar, 25 lbs.  $(\text{NH}_4)_2\text{SO}_4$  and 3 gals. benzene motor fuel per ton of coal. The plant shows in a practical way that bulk carbonization is a method of operation which must occupy the attention of the gas industry.  
J. L. WILEY.

Chester producer fired by-product coke ovens. J. D. SHATTUCK. *Gas Age* 43, 7-10(1919).—A description of a Semet-Solvay installation originally designed to carbonize 300 tons of coal per day for production of city gas and recovery of by-products. It consists of 40 ovens built in 1903-4,  $\text{NH}_3$ , tar, light oil, cyanogen and naphthalene recovery plants, and 4 Taylor gas producers which furnish gas for heating the ovens, increasing the city gas supply, and keeping up the steam requirements. A very efficient operation is suggested in thus combining the functions of both coke-oven plant and gas plant under one installation.  
J. L. WILEY.

Republic by-product coke plant at Youngstown. ANON. *Gas Age* 43, 13-5 (1919).—An installation of 143 Koppers 13.25-ton ovens with complete by-product recovery plant. It produces gas and coke for the plant of the Republic Iron & Steel Co. It carbouizes 2800 tons of coal per day, with a production of 1900 tons furnace coke, 140 tons coke breeze, 61,000 lbs.  $(\text{NH}_4)_2\text{SO}_4$ , 25,200 gals. tar, 16 million cu. ft. surplus gas, and 8,000 gals. benzene.  
J. L. WILEY.

Preparation of domestic coke. A. H. HARRIS, JR. *Gas Age* 43, 17-8(1919).—A detailed description of the prepn. of domestic coke from by-product ovens as carried out at the plant of the Coal Products Mfg. Co., Joliet, Ill.  
J. L. WILEY.

Insulation for by-product coke ovens. P. A. BOECK. *Gas Age* 43, 24-6(1919).—A discussion of the methods used in insulating the various parts of a by-product oven by means of Sil-O-Cel insulating brick and powder. This material is made from natural celite rock; it will withstand a temp. of 1800° F. without shrinkage and has a melting point of 2930° F. It is stated that Sil-O-Cel insulation will reduce heat losses by radiation by 60-75%.  
J. L. WILEY.

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#### Industrial efforts of France during the war (MAOUSSA) 18.

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Composite fuel. WM. CLAYTON. Can. 188,318, Jan. 21, 1919. The fuel contains coal screenings 20, charcoal or peat 10, loam 25, clay 10, sawdust 15, sand 5, lime 2, linseed or crude oil 13.

Gas manufacture. J. T. KEY. Brit. 120,139, Dec. 14, 1917. Cannel or other coal is coked in retorts which are built up in sections and are arranged in series which deliver their gaseous products into mains provided with sets of grids, the openings of



alternate grids being arranged in rows which are at right angles to each other or are otherwise arranged to cause the gases to take tortuous paths. Superheated steam is introduced into the retorts from mains by pipes, at the end of the period of ordinary distn. by heat, and the action of this on the coke, and the subsequent mixing and vaporization of the products in the main is adapted to yield a high vol. of gas per ton of coal. Valves and dampers are employed so that some of the ovens may be charged while others are being worked; and steam is admitted to some of the ovens while the others are giving off gas without the aid of the steam.

**Gas manufacture.** S. N. WELLINGTON. Brit. 120,223, July 30, 1917. Gas from the low-temp. distn. of coal or other carbonaceous material is reheated by means of producer gas in a heat-exchanger on the way from the tar-separator to the  $\text{NH}_3$  saturator. The heat-exchanging app. may take any suitable form.

**Desulfurizing gases, etc.** H. W. HEMINGWAY. Brit. 117,387, Nov. 21, 1917. In desulfurizing coal gas, etc., by means of  $\text{FeCO}_3$ , as described in 12,093, 1901, the  $\text{FeCO}_3$  is recovered by converting the  $\text{FeS}$  obtained into  $\text{FeSO}_4$  and then treating the effluent or "sweet" liquor with the  $\text{FeSO}_4$ . The  $\text{FeCO}_3$  pptd. is recovered for use in the first stage.

**Horizontal coking ovens.** O. PIETTE. Can. 188,587, Jan. 21, 1919. Structural features.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

**A new British oil industry.** E. H. C. CRAIG, F. M. PERKIN, A. G. V. BERRY AND A. E. DUNSTAN. *J. Inst. Petroleum Tech.* 4, 110-57(1918).—See C. A. 12, 1119.

E. H.

**Borneo petroleum and its uses.** A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9550-2(1918); cf. C. A. 12, 2711.

JOHN B. TUTTLE.

**The oil-bearing lands of Morocco.** M. MOUSSU. *Bull. soc. encour. ind. nat.* 130, 248-54(1918).—The oil is found in the dried beds of small rivers. During the rainy season the oil is carried in the small streams in an emulsified condition. The oil is heavy, brown, almost black. The sp. gr. ranges from 0.900 to 0.906. The distn. begins at 90°, 4% off at 150°, 20% at 200°, 72% at 225°. The gravity of the distillate ranges from 0.800 to 0.830.

O. E. BRANSKY.

**The relation between viscosity and the chemical constitution of lubricating oils.** A. E. DUNSTAN AND F. B. THOLE. *J. Inst. Petroleum Tech.* 4, 191-228(1918).—See C. A. 12, 1596.

E. H.

**Lubricating oils.** DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, LONDON. *J. Ind. Eng. Chem.* 11, 155(1919).—A memorandum issued by this dept., dealing with the subject of cutting lubricants and cooling liquids, states that the mineral oils which are best suited for the first named purpose, either by themselves or in combination with oils of animal or vegetable origin, are those of pale color and low viscosity ranging from 100 to 200 sec., Redwood Standard, at a temp. of 200° F. For high-speed conditions oils of lower viscosity can be used and similarly oils of higher viscosity are suitable for low-speed work. Taking the animal oils, used either alone or in combination with one another, it is found that prime lard oil is practically free from acid while tinged lard oil contains a percentage as high as 15 in some cases. The tinged oil is less costly in the first place but is more inclined to gum under severe conditions. Since lard oil congeals in cold weather it should be mixed with good low-cooled mineral oil for winter use.

E. J. C.

**Present status of oil shales.** ANON. *Chem. Met. Eng.* 20, 28-31(1919).—Besides the huge deposits of oil shales occurring in Utah, Wyoming, Colorado, Nevada and small areas all over the Rocky Mountains, there are numerous small deposits of asphaltic sandstones distributed over the Western plateau. In spite of the many processes and companies devised and organized for getting the oil from the shales, no oil has been produced. The Scottish retort combined with the labor-saving devices of the modern by-product coke oven is recommended as the best installation for distg. the oil shales. The distillates are full of highly unsatd. compds., containing considerable N and S. The acid-treating losses are very heavy. The amt. of recoverable N is small. The asphaltic sandstones have been extd. with solvents, such as gasoline, and a heavy residuum of about 10° Bé. resembling Mexican and California crude has been obtained.

O. E. BRANSKY.

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**Separation of mineral oil from saponifiable oil (PRATHER) 27.**

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**Distilling petroleum.** C. B. FORWARD. *Brit.* 117,372, Oct. 27, 1917. In distg. petroleum to obtain motor fuel oil, the petroleum is gradually heated to 400° F. or higher by passage through long coils exposed to superheated steam, and is then mixed with superheated steam in an atomizer or injector and is delivered into a separator in which the motor fuel oil is vaporized. Superheated steam is obtained from a high-pressure generator fitted with superheating coils and is divided into two parts, one passing through a pipe to the atomizer, and the other passing through heaters in counter-current to the oil flowing through the long coils specified. The steam leaving the last heater in the series is used for heating and power purposes. A pressure of 100-200 lb. per sq. in., and a temp. of 400-600° F. or higher, are maintained in the separator. The vapors leaving the separator are led to a clarifying column containing baffles, and thence through a pressure-reducing valve to a condenser.

**Cracking hydrocarbons.** R. B. DAY. *Brit.* 120,230, Sept. 27, 1917. Hydrocarbon oils, of a relatively low b. p., such as gasoline, benzene, toluene, etc., are obtained from heavier oils of a high b. p. by heating the heavy oil, mixing it in predetd. proportions with heated H<sub>2</sub>O by means of sets of H<sub>2</sub>O and oil pumps, spraying the mixt. into a heating chamber or tube heated to a temp. of from 600 to 2000° F., and subjecting the mixt. to the action of a catalytic agent consisting of an alloy of Ni, Cr and steel placed at the outlet end of the chamber or tubes, the mixt. being then passed through an oil-cooled primary condenser for removing the uncracked oils and a water-cooled secondary condenser for condensing the hydrocarbons of lower b. p. Each set of pumps delivers into a common chamber and the driving-means of the H<sub>2</sub>O pumps is made adjustable. The pressure in the heating chambers or tubes may vary from atm. to 300 lb. per sq. in. A suitable form of app. is specified, with details of operation.

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### 23. CELLULOSE AND PAPER.

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A. D. LITTLE.

**Stabilization of celluloid.** A. COLASSI. *Caoutchouc et gutta-percha* 15, 9604-5 (1918).—During the nitration of cotton for celluloid, higher nitrates are formed insol. in the usual solvents. These are not removed by washing with cold water. C. proposes to wash the nitrated cotton with warm water in a Hollander, during which the higher nitrates are powdered and washed out. This is all that is necessary for stabilization.

JOHN B. TUTTLE.

**Notes on the analysis of celluloid.** A. HERVE. *Caoutchouc et gutta-percha* 15, 9601-4(1918).—H. has adapted a modification of Raoult's f.-p. app. for the detn.

of camphor in celluloid. A 2-5 g. sample is cut into small pieces, placed in a 500-cc. flask with 200 cc.  $H_2O$  and 2-3.5 g.  $KOH$ , and the flask is connected to a condenser. The nitrocellulose is dissolved, and the camphor distd. Most of the camphor collects in the condenser. The aq. distillate is washed with 2 portions of  $C_6H_6$  (5 cc. each). These are collected and used to wash out the condenser, which is then washed with 5 further portions of 5 cc.  $C_6H_6$ . The  $C_6H_6$  soln. is dehydrated with anhydrous  $CuSO_4$ , filtered and made up to 50 cc. at  $20^\circ$ . The app. is constructed as follows: A tube containing the  $C_6H_6$  soln. is placed in a closed tube containing  $CS_2$ . The outer tube has a pipe leading to the bottom of the  $CS_2$  and ending in a ring. The pipe is pierced with small holes, through which air is blown. A second pipe provides an exit of the air and  $CS_2$  fumes. Evapn. caused by the current of air lowers the temp. sufficiently for the detn. The lowering of the f. p. of the  $C_6H_6$  is noted with a Beckmann thermometer and the % of camphor calcd. A table of values is given. Results give 28.2 and 27.9% against a calcd. value of 28.55%.

JOHN B. TUTTLE.

**Cello yarn—the latest cellulose yarn.** *Svensk Papperstidning* 1918, No. 22, 523.—New inventions for the manuf. of cellulose yarn are constantly being made in Germany. The latest invention is "Cello yarn." This is considered equal to "Stapel-faser" without being identical with it. It is flexible, strong and washable. The methods of manuf. have been worked out by Adolf Kube Co., G. m. b. H., of Dresden.

G. HALLBERG.

**South African grasses for paper making.** ANON. *Bull. Imp. Inst.* 16, II, 127-34 (1918).—A sample of Johnson grass (*Sorghum halepense*) gave on analysis moisture 10.3%, ash 7.4, cellulose 52.5 (the last two are expressed on the dry grass). The grass was treated with caustic and gave 45-50% dry pulp which yielded a tough parchment-like paper. A sample of thatching grass (*Andropogon buechananii*) contained moisture 10.1%, ash 6.3, cellulose 53.8% (with the last two expressed on the dry grass). Boiling with 10-20% caustic gave 46-52% pulp which furnished an opaque paper of good strength and quality. Specimens of *Andropogon oregeamus* (tamboukie grass) contained moisture 9.1%, ash 4.5, cellulose 47.4%. Treatment with soda yielded 40-50% pulp, which could readily be bleached and used for the production of white paper of good quality. A sample of *Andropogon hirtiflorus* contained moisture 8.7%, ash 3.8, cellulose 55.8%. Boiling with soda solns. of varying concns. yielded 50-54% pulp. This pulp yielded paper that was weak but could be bleached to a good color.

R. L. SIBLEY.

**Production of pulp in Japanese Sachalin.** *Svensk Papperstidning* 1918, No. 22, 523.—The manuf. of pulp in Karafuto (Japanese Sachalin) is constantly growing. The yearly production is expected shortly to be 100,000 tons. It is considered that the Japanese paper mills will be very soon altogether independent of the import of foreign pulp.

G. HALLBERG.

**Manufacture of paper-pulp from dead leaves.** KAREN BRAMSON. *Compt. rend.* 166, 853-4 (1918).—See *C. A.* 12, 2053.

R. B. ROE.

**Color reaction of mechanical wood pulp or of the incrusting substances of wood with phenylhydrazine hydrochloride.** S. JENTSCH. *Z. angew. Chem.* 31, 72 (1918); *J. Soc. Chem. Ind.* 37, 365-6A.—See *C. A.* 12, 2052.

R. B. ROE.

**Chemical investigation of black liquor.** E. J. HOFFMAN. *Paper* 23, No. 19, 11-3 (1919).—A 10-l. sample of concd. black liquor from a soda-pulp mill on distn., yielded 850 cc. of aq. distillate and 710 cc. of tars, the latter corresponding to 100 kg. per ton of pulp. The tar distillate on fractional distn. yielded 73% up to  $280^\circ$ . The fraction up to  $100^\circ$  amtd. to nearly 20% of the tar, and consisted of approx. 6% oil and 14% water. The oily portion contained small amts. of aromatic hydrocarbons. Of the portion distg. from  $100$  to  $280^\circ$ , approx. 70%, or 37% of the original tar, was sol.

in dil. NaOH. The fraction from 100° to 280° was further distd. and found to contain approx. 10% of phenolic compds. As a result of the investigation it seems impracticable to attempt to utilize this tar or any of its fractions as a source of raw materials for explosives.

R. B. ROE.

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Waste pulp from New Zealand hemp (ANON.) 25.

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Cellulose and fodder from wood and the like. J. KÖNIG. *Holl.* 2,504, Oct. 1, 1918. After a suitable acid or alk. treatment, the wood is treated with sulfite.

Coated paper. H. R. RAFSKY. *Brit.* 117,414, Feb. 23, 1918. Paper is coated with "lime mud," a material obtained as a ppt. in the causticizing, by means of lime, of the  $\text{Na}_2\text{CO}_3$  obtained from the waste liquors produced in the wood pulp, esparto pulp, and other industries. The "lime mud," which may be reduced by grinding, is mixed with an adhesive such as casein and a small amt. of alkali.

## 24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Nitration of cellulose and determination of the nitrogen content in cellulose nitrates. A. HERVÉ. *Mon. Sci.* 8, 241-5 (1918); cf. *C. A.* 13, 186.—The investigation had for its object the verification of Lunge's work (*Mon. Sci.*, May-June, 1902) as applied to particular cases, viz., the effect on the N content of variations in (1) the per cent. of  $\text{H}_2\text{O}$ , and (2) of  $\text{HNO}_3$  in the nitration mixt. All expts. were conducted at 25°, the duration of nitration was 25 mins., and the ratio of cellulose to the mixed acids was 1:100. The individual results are presented in tabular form and show that starting with  $\text{H}_2\text{SO}_4$  66.97,  $\text{HNO}_3$  14.91 and  $\text{H}_2\text{O}$  18.12, and increasing the  $\text{H}_2\text{O}$  in 5 successive steps to 20.23 the  $\text{H}_2\text{O}$  in the spent acids rose steadily from 18.44 to 20.52 and the N content of the product fell steadily from 11.16 to 10.08. Also starting with  $\text{H}_2\text{SO}_4$  66.85,  $\text{HNO}_3$  14.55 and  $\text{H}_2\text{O}$  18.66 and increasing the  $\text{HNO}_3$  in 6 successive steps to 18.84, the N content of the product rose steadily from 10.81 to 11.14. In both series the  $\text{H}_2\text{SO}_4$  was the second variable in the nitration mixts.,  $\text{HNO}_3$  remaining practically const. in the 1st series and  $\text{H}_2\text{O}$  in the 2nd. H. describes the methods employed for regenerating the spent acids for re-use and dwells upon the importance of proving, by analysis, that the mixt. is perfectly homogeneous. Examples of acid mixts. tested at various stages of blowing are given showing as much as 2.3% difference on the  $\text{HNO}_3$  and 2% on the  $\text{H}_2\text{O}$  which, if used in nitration, would lead to a difference of 1.19% in the N contents. Detailed descriptions of the Lunge and the Crum methods of detg. N used are given.

CHARLES E. MUNROE.

Powders and explosives. GEORGES VIE. *Rev. prod. chim.* 21, 273-4, 292-3 (1918).—A popular review consisting mostly of material which has been repeatedly published. A novelty is a new classification entitled "Explosives of juxtaposition" to designate brisant explosives composed of substances which separately are completely inert. Favier's explosives are cited as an example. A table is given of the wt. of powder necessary to propel projectiles of various sizes and as charges for mines and torpedoes. Also the wts. of  $\text{HNO}_3$  required in the manuf. of one metric ton of the following: Melinite 1820 kg., T. N. T. 1760 kg., nitroglycerin 1180 kg. and nitrocellulose (for powder) 1000 kg.

CHARLES E. MUNROE.

Standardization of mining methods. IV. Explosives. CHARLES MITKE. *Eng. Min. J.* 106, 982-7 (1918).—A description, with illustrations, of methods for handling and storage of explosives, on the surface and underground, loading and blasting, with the order of procedure to insure safety. The machines shown for cutting running fuse

and for prepg. cartridges of clay stemming and the fuse cans for transporting capped fuse to the mine are of special value.

CHARLES E. MUNROE.

**The dangers of explosion with inflammable liquids and vapors.** W. PAYMAN. *J. Soc. Chem. Ind.* 37, 406-82 (1918).—Danger of explosion from ignition of mixts. of inflammable vapors and air exists in many industrial operations such as: (A) Processes in which volatile combustible liquids are used for crystn., pptn., or solvents, or when being nitrated or sulfonated. (B) When being vaporized from finished products in drying stoves or rooms. (C) During storage and transfer. Important criteria for judging the liability of a given liquid to produce dangerous conditions are: (1) Its volatility. (2) The range of explosion of mixts. of its vapor with air. (3) The speed of propagation of flame in these mixts. (4) Their ease of ignition. Attention must be given to the possibility of ignition of such mixts. by mechanical means such as by sparks, caused by grinding of ill-fitting parts, or by over-heated bearings. Inert gases should be substituted for compressed air in moving these liquids. Their evapn. during storage may be retarded by reducing the area of exposed surface. The following table of data is presented:

| Substance.             | Lower limit.<br>Per cent. | Corresponding<br>temp., ° C. | Upper limit.<br>Per cent. | Corresponding<br>temp., ° C. |
|------------------------|---------------------------|------------------------------|---------------------------|------------------------------|
| Benzene.....           | 1.4                       | —5                           | 4.7                       | 5                            |
| Toluene.....           | 1.4                       | 7                            | 4.7                       | 30                           |
| Ethyl alcohol.....     | 4.0                       | 15                           | 13.6                      | 35                           |
| Methyl alcohol.....    | 7.8                       | 13                           | 18.0                      | 26                           |
| Ethyl ether.....       | 1.8                       | Below — 30                   | 5.2                       | —28                          |
| Acetone.....           | 2.35                      | Below 20                     | 8.5                       | Below 20                     |
| Carbon disulfide.....  | 4.1                       | Below 20                     | ...                       | ...                          |
| Petroleum benzine..... | 1.1                       | ...                          | 3.8                       | ...                          |
| Gasoline.....          | 1.5                       | ...                          | 5.3                       | ...                          |
| Pentane.....           | 1.35                      | Below 0                      | 4.50                      | Below 0                      |

The limits of inflammability are expressed in percentage by vol., and refer to downward propagation of flame. The "Limit Temps." have been calcd. from the vapor pressures in Landolt-Börnstein. Each topic is discussed fully and much literature is cited.

CHARLES E. MUNROE.

Chemical investigation of black liquor (HOFFMAN) 23.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**Dyes and the development of British chemical industry.** ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS. *Nature* 102, 272-3 (1918).—A memorandum presented to the President of the Board of Trade setting forth the views of the executive council of the association on the present situation in that section of chem. industry which is directly concerned with the production of dyes.

W. H. ROSS.

**Waste pulp from New Zealand hemp.** ANON. *Bull. Imp. Inst.* 16, 134-8 (1918).—A large amt. of waste pulp is obtained from the leaves of the New Zealand hemp plant (*Phormium tenax*). Two samples of this pulp were taken; one was sun-dried before placing in sacks, the second was rotted for 2 mos., sun-dried, then placed in sacks. These samples were examd. as to their value for the manuf. of paper pulp. Analysis gave: (sun-dried) moisture 8.3%, cellulose in dry pulp 31.8%; (rotted sample), moisture 8.9%, cellulose 37.4%. In both cases the cellulose was of poor quality and of no value for paper making. The pulps were investigated to ascertain their fertilizer value

and the possibility of using them as sources of potash salts. Analyses of the materials are given and the figures are compared with an analysis of stable manure. The results show that the pulp would have considerable fertilizer value on account of the N (1%),  $K_2O$  (2.93 and 3.93%) and  $H_3PO_4$  (0.4% as  $P_2O_5$ ). The rotted material contained the higher % of  $K_2O$ , while the N and  $P_2O_5$  did not vary much. Wt. for wt. the dried materials contain twice as much N, the same amt. of  $P_2O_5$ , and 5-6 times the amt. of  $K_2O$  as stable manure. The heating value of the sun-dried pulp is about 45% that of good steam coal.

R. L. SIBLEY.

Nature of cyclic quinoneimide dyes (KEHRMANN) 10. The linear phenonaphth-acridonequinone and quinacridonequinone (LESNIANSKI) 10. Synthesis of amino-flavones, of flavoneazo- $\beta$ -naphthol dyes and of other flavone derivatives (BOGERT, MARCUS) 10. Industrial efforts of France during the war (MAOUSSA) 18. Isolation of dyes with picric acid and dichloropicric acid (WILLSTÄTTER, SCHUDEL) 10. Tintometry (SCHELL) 2.

Dyes from oxylignin or oxylignone. E. ØMAN. Norw. 28,913, July 8, 1918. Oxylignin or oxylignone is converted into nitroso compds. by reaction with  $HNO_3$  or substances yielding it, such as nitrite and acid.

Dyes from lignin- or lignonesulfonic acid or salts thereof. E. ØMAN. Norw. 28,934, July 15, 1918. The initial materials are converted into nitroso compds. by treatment with  $HNO_3$ .

Obtaining textile fibers. A. F. W. BRUMMER. Brit. 120,199, Aug. 21, 1918. Fibers are obtained from grass, reed, rushes, straw, stalk, bark, and like vegetable materials by boiling with an alkali sulfide, such as  $Na_2S$  or an alk.-earth sulfide or a mixt. of such sulfides, and subsequently treating with hot alum soln., or with a soln. of  $Na_2S_2O_3$  to which a little  $H_2SO_4$  has been added. The product is washed and dried.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

The determination of volatile "thinners" in oil varnishes. A. DE WARLE. *Analyst* 43, 408(1918).—de W. and Smith in a previous paper (*C. A.* 11, 2547) recommended the use of  $Me_2CO$  for removal of last traces of  $H_2O$  from the non-volatile residues obtained in the steam distn. of oil varnishes. Highly polymerized oils, however, present in some varnishes, are not sol. in  $Me_2CO$ ; so that residual  $H_2O$  is removed with difficulty. This  $H_2O$  can be completely removed by boiling out the residue twice, using about 10 cc. each time, with a mixt. of 3 parts benzene and one part alc. F. A. WERTZ.

Paint. J. C. BENNECHER. U. S. 1,287,836, Dec. 17. A paint suitable for use on wood or metals is prepd. by mixing 75 kg. of dry color with sufficient linseed oil and petroleum to form a paste, forming another pasty mixt. of  $Ca(OH)_2$  and  $H_2O$ , aggregating the 2 mixts. and mixing with additional oil and petroleum, then adding a soln. of yellow soap 10 kg. in  $H_2O$ , and finally adding 16 kg. resin melted in 10 l. boiled linseed oil.

Paint. KOPPERS CO. Can. 188,272, Jan. 14, 1919. A paint having as its essential constituent a colloidal soln. of coal-tar pitch in solvent naphtha will readily dry to form a smooth, glossy surface. The coal-tar pitch has a relatively low content of free C.

**Pigments.** NEW JERSEY ZINC CO. Brit. 120,194, Apr. 12, 1918. Zn-Pb pigments are obtained by roasting oxidized ores of Zn and Pb so as to volatilize the Zn and Pb under oxidizing and sulfatizing conditions, in order to sulfatize the Pb without materially effecting the ZnO. A suitable furnace is specified.

## 27. FATS, FATTY OILS AND SOAPS.

R. SCHERUBEL.

**Oils in Germany.** ANON. *Int. Rev. Sci. Practice Agr.* 8, 1128(1917); *Bull. Imp. Inst.* 16, 254(1918).—Owing to the shortage of oils in Germany attention has been turned to a number of seeds which can be obtained from indigenous plants or plants grown there. Among those exptd. with are rape, sunflowers, poppies, beechnuts, walnuts, horse-chestnut, lime-seed, spruce seed. It appears that beechnuts are to be used for human consumption, while horse-chestnuts and acorns are to be reserved for cattle food.

R. L. SIBLEY.

**Tomato seeds.** ANON. *Bull. Imp. Inst.* 16, 254(1918).—Tomato seeds and skins obtained as waste products of the canning industry are dried and the seed is sepd. from skin by sifting. The seeds then yield 22% of an oil of pale yellow color and a bland nut-like taste and odor. The residual cake has given satisfactory results in feeding expts.

R. L. SIBLEY.

**Marine animal oils from the Antarctic.** ANON. *Bull. Imp. Inst.* 16, 140-5(1918).—Five samples of sea-leopard oil upon analysis gave sp. gr. 0.924, acid value 0.3 to 1.1, sapon. value 193.7 to 195.1, iodine value 119.7 to 127.1, insol. fatty acids 94.6%, unsaponifiable matter 0.5%, sol. volatile acids 0.65%, insol. volatile acids 1.05%, solidifying point 3-11.9°. Seven samples of seal oil gave the following results: sp. gr. 0.924-0.931, saponification value 192 to 201.5, acid value 0.8 to 4.2, iodine value 122.1 to 147.8, insol. fatty acids 94.3%, unsaponifiable matter 0.9%, sol. volatile acids 0.6%, insol. volatile acids 0.9%, solidifying point of fatty acids 16° to 19°. Penguin oil gave d. 15° 0.932, acid value 2.3, sapon. value 1975, iodine value 126.7, insol. fatty acids 94.7%, unsaponifiable matter 0.5%, sol. volatile acids 0.65%, insol. volatile acids 1.0, solidifying point fatty acids 31.4°. The sea leopard oil and Weddell seal oil are very similar in character, although there appears to be a larger amt. of stearin in the latter. All the oils are suitable for soap making and yielded a considerable quantity of glycerol. The oils could be used for any purposes to which commercial seal and whale oils are put.

R. L. SIBLEY.

**Note on the separation of mineral oil from saponifiable oil.** P. W. PRATHER. *Chem. Analyst* 26, 19(1918).—In sepg. mineral oils from saponifiable oils, emulsions are frequently encountered after the soap soln. is shaken with Et<sub>2</sub>O in a sepg. funnel. The emulsion can be destroyed and sharp sepn. obtained by applying the hose of a good suction pump to the mouth of the funnel.

H. M. LANCASTER.

**Sunflower (KRAUS) 15. The chemical constitution of squalene (KUBOTA) 10.**

**Separating liquid and solid constituents from fats.** W. P. SCHUCK. U. S. 1,288,228, Dec. 17. In sepg. liquid and solid constituents from oils, e. g., coconut oil, about 5% of flax or similar fiber is mixed with the oil, this mixt. is molded into cakes, and the latter are pressed while enclosed in filter cloths at a temp. slightly below the m. p. of the oil. After expressing the normally liquid constituents, the residue is melted and sepd. from the fiber.

**Hydrogenated oil mixture suitable for use in foods, lubricants or abrasives.** C. ELLIS. U. S. reissue 14,568, Dec. 17. See original pat. 1,276,509; C. A. 12, 2139.

**Hydrogenated oil mixture for making sound records.** C. ELLIS. U. S. reissue 14,569, Dec. 17. See original pat. 1,276,508; C. A. 12, 2139.

**Hydrogenated oil mixture for making sound records.** C. ELLIS. U. S. reissue 14,570, Dec. 17. See original pat. 1,276,507; C. A. 12, 2139.

**Extracting oils.** A. M. WINTERS. Brit. 120,156, Jan. 24, 1918. Oil-bearing material such as offal or crushed seeds, beans, nuts, etc., passes from a hopper through one or more extg. chambers provided with conveying worms wherein it is treated with solvents, such as benzine, supplied through the perforated shafts of the worms or through perforation in the upper parts of the chambers covered by a jacket. The solvent is supplied to the first two of the chambers but not to the third. The solvent passes from the chamber through removable sieves and by pipes into a chamber containing inclined baffles and sieves and heated by steam from a pipe. The solvent vapors are led to a condenser and the condensed solvent is returned to the extn. chambers,  $H_2O$  being sepd. in a gravity separator. The oil is removed by a pipe. The material, after passing through the extn. chambers, falls down a chute into a chamber heated by steam from a pipe and containing inclined grids or sieves. The solvent is removed as vapor and is returned to the extn. chambers by way of condensers and water-separator. Air, laden with solvent vapors from various parts of the app., is passed through a washer to sep. the solvent.

**Cleansing compositions.** G. A. PAULIN. Brit. 120,195, June 26, 1918. A cleansing compn. is prepd. by mixing powdered casein with a satd. soln. of  $Na_2CO_3$  and mixing the product with a resin soap prepd. by saponifying com. resin with  $NaOH$ . The compn. may be scented with oil of thyme, oil of lemon thyme, essence of mirbane, etc.

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## 28. SUGAR, STARCH AND GUMS.

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A. HUGH BRYAN.

Some notes on the clarification of the juice from frozen or sour cane. C. E. COATES. *Louisiana Planter* 62, 40-1(1919).—Freezing may affect the compn. of juice of standing cane in 3 ways: (1) Fiber may be partly converted into sol. gums; this effect can be remedied to some extent by adding dil.  $H_3PO_4$  or  $H_2SO_4$  in the pan. (2) Dextran and similar gums may be formed; this can be detected by polarizing in alc. soln., and it is stopped by thorough disinfection of tanks and machinery. (3) Acetic fermentation may set in; excess acidity in juice should be neutralized with  $Na_2CO_3$ . Crystn. in sirups from frozen cane can be induced by seeding with sugar crystals or powdered sugar.

F. W. ZERBAN.

Why not shredders in Louisiana? K. R. MORGAN. *Louisiana Planter* 62, 39 (1919).—Use of the Searby shredder has raised the extn. in a Hawaiian factory to 97.5% sucrose in cane, and over. Its use is recommended for Louisiana.

F. W. ZERBAN.

Some observations on the rust disease of beet-foilage. W. BARTOS. *Blätter für Zuckerrübenbau* 24, 152(1917); *Biedermanns Zentr.* 47, 263-5(1918).—This rust disease is inheritable. It is customarily disregarded by the farmer as it ordinarily appears only on the fully mature beet plant. B. found that beets of the same variety taken from the same field contained 22.02% sugar when their foliage was entirely free from rust and 21.48% when attacked by rust. These were resp. planted as seed beets on adjacent plots. The sugar content of the crop from the infected seed was 1.5% less than that of the healthy crop and the yield of beets was less for the seed used.

ALBERT R. MERR.



The improvement of the indigenous methods of gur and sugar making in the United Province, B. E. I. WILLIAM HULME AND R. P. SANGHI. *Louisiana Planter* 62, 42-5(1919).—Description of native methods and those used in an exptl. factory of more modern design.  
F. W. ZERBAN.

Method for the preparation of soluble starch. JAMES CRAIG SMALL. *J. Am. Chem. Soc.* 41, 113-20(1919).—Weighed amts. of raw potato starch were boiled under a reflux for measured time intervals in 95% alc. containing varying amts. of concd. HCl and then either quickly filtered and washed free of acid with distd.  $H_2O$ , or treated with the calcd. amt. of  $NaHCO_3$  to neutralize the HCl and washed with alc. In the samples so obtained quant. detns. were made of the total and sol. starch (see following abstr.) and qual. tests were also made for unchanged starch, dextrans and lower reducing carbohydrates. From these preliminary expts. it would seem that for a 20% suspension of starch in alc. 0.75 cc. of HCl (d. 1.19) per 100 cc. effects complete conversion of the starch in 10 min. and yields a product in which no dextrans or reducing carbohydrates can be identified. Another series of expts. in which only the amt. of HCl was varied confirmed the above result.  
CHAS. A. ROUILLER.

Quantitative determination of soluble starch in the presence of starch and its hydrolytic cleavage products. JAMES CRAIG SMALL. *J. Am. Chem. Soc.* 41, 107-12 (1919).—The iodide of sol. starch is readily pptd. from its solns. in the presence of dextrans and lower carbohydrates by an equal vol. of satd.  $(NH_4)_2SO_4$  and this ppt. can be washed free from the other carbohydrates by half-satd.  $(NH_4)_2SO_4$ ; on heating the ppt. in  $H_2O$  suspension the I is driven off and the sol. starch can then be hydrolyzed by acids and estimated by the usual methods for detg. dextrose. Amylodextrin also comes down in half-satd.  $(NH_4)_2SO_4$  in the presence of excess of I but can be washed out if no I is added to the successive wash liquids and it can thus be also detd., either directly or indirectly.  
CHAS. A. ROUILLER.

#### Determination of dextrose with hypiodite (WILLSTÄTTER, SCHUDEL) 7.

Glycerol from fermentation of sugars. J. R. ROFF, JR. U. S. 1,288,398, Dec. 17. "Black strap" molasses, or similar material, dild. until it contains about 11% total sugars, is fermented so as to obtain a 20% conversion of the sugars into glycerol. During the fermentation the alkalinity of the material is maintained, by successive additions of  $Na_2CO_3$ , just short of the degree which would inhibit further fermentation. Various yeasts, both *Cerevisiae* and *Ellipsoideus*, may be used in carrying on the process but the California wine yeast of the *Ellipsoideus*, variety Steinberg, gives best results. The yeast is preferably first cultivated in sterile grape juice containing dextrose and nutrient salts and, during its cultivation,  $Na_2CO_3$  or  $K_2CO_3$  is added. The yeast is then added to the molasses or to a mixt. of a wort prepd. from malt sprouts and dextrose and fermentation of the latter carried on in alk. soln. to form glycerol. The pat. is dedicated to the public for free use without payment of any royalty.

Glucose. F. B. LA FORGE. U. S. 1,288,429, Dec. 17. In making glucose from corn cobs, the latter are subjected to hydrolysis with dil.  $H_2SO_4$ , the undissolved solid material is washed free from acids and other sol. substances, dried, finely ground, mixed with about an equal weight of 75%  $H_2SO_4$ , allowed to stand for several hrs., and heated with a large quantity of  $H_2O$  until hydrolysis is complete. The soln. is then filtered, neutralized with  $Ca(OH)_2$ , the ppt. is filtered out and the soln. is concd. until glucose seps. in crystd. form.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

Recent developments in leather chemistry. HENRY R. PROCTER. *J. Roy. Soc. Arts* 66, 747-53, 776-81; *J. Am. Leather Chem. Assoc.* 13, 582-95 (1918); 14, 30-41 (1919).—A lecture delivered before the Royal Society of Arts, May 13, 1918, in which some of the important processes preliminary to tanning and the improvements made in them are described. The anatomical structure and the chemistry of skin are briefly discussed while the various methods of unhairing, deliming, bating, puering, and drenching are treated in detail. All of the above processes involve the swelling and falling of hide fibers and because of this the author has, for the last 20 years, devoted much study to the process of pickling, which process "involves both swelling and falling, and will in itself convert skin into a sort of leather, so that manifestly its full explanation would throw a good deal of light on the whole theory of tanning." In the discussion of the author's expts. and results of this study the theory of swelling is given.

R. W. FREY.

Theory of leather formation. V. W. FAHRION. *Collegium* 1918, 173-8, 213-4; *J. Soc. Leather Trades Chem.* 2, 304-5 (1918).—Polemical against Moeller's criticism of the chem. theory of tanning. Oryng (*Kolloid-Zig.* 22, 149 (1918)) says all adsorption compds. are being proved to be chem. compds. If so, discussion as to whether tanning is chem. or phys. will vanish. There is no analogy between the behavior of formaldehyde with collagen and with albumin, since collagen is an albuminoid, not an albumin. Acetaldehyde tans very little, and aromatic aldehydes scarcely at all because  $\text{CH}_3$  must be directly connected to aldehyde O in a tanning substance. The reaction of the polymerization products of formaldehyde on collagen can be explained by catalysis without Moeller's peptization theory. Moeller's expts. with acetone and with *o*-nitrobenzaldehyde are not conclusive. Even the polymers of formaldehyde are chem. compds. and such an addition compd. can be assumed in case of the collagen-acetone system. Moeller's expts. in quinone tannage do not offer convincing proof. The decompn. products of quinone and  $\text{H}_2\text{O}$  are shown to be unnecessary for tanning, and hence Moeller's peptization theory is unnecessary and incorrect. W. B. J.

Causes of brittle grains. ANON. *Halle aux cuirs*, Oct. 27, 1918; *J. Soc. Leather Trades Chem.* 2, 307.—When leather is too rapidly dried out of either mineral or vegetable tan, moisture from the interior carries and deposits non-tans just under the surface of the grain and upon it. To prevent this, the surface may be lightly, but especially in sole leather not too heavily oiled. W. B. J.

The quinone tannage. I. W. MOELLER. *Collegium* 1918, 71-8, 93-105; *J. Soc. Leather Trades Chem.* 2, 190-1, 243-4.—Quinone has been obtained from many materials containing tannins by oxidation. There is much evidence indicating that tannins have a quinone character. Quebracho, phlobaphenes when distd. with zinc dust give anthracene, Nierenstein (*Ber.* 1907) thinks that this is from rufgallic acid, which is a hexahydroxyanthraquinone. Powarin found hydroxyanthraquinone in willow bark tannin. Korner found that by passing air into an aq. soln. of quebracho tannin phlobaphenes were obtained which differed very little in their chem. compn. from the tannin. The phlobaphenes always present in the quebracho soln. only sep. out because of the oxidation of the peptizer to dark colored humins. The amorphous brown compds. obtained by oxidizing or heating pyrogallol (Procter, *L. I. L. B.* 115, 120) are related to, if not identical with, those products obtained by oxidizing quinone in aq. soln., which give rise to the tanning effect of quinone. By disturbing the peptizer through oxidation in a vegetable tanning ext. soln., the colloid-chem. character of the soln. is also changed. A large part of the peptized phlobaphenes is pptd.

along with the dark colored humins, which are absorbed by the phlobaphenes, causing darkening. The very readily sol. peptizer is converted into a colloidal substance very similar to the phlobaphenes. An intermediate product of this oxidation is always benzoquinone, the quinhydrone of which colors the soln. an intense red, to which may be attributed the color of the phlobaphenes. The quinones are formed as intermediate products by the oxidation of the peptizer of the vegetable tannin colloids. Catechol contains a coumarin nucleus. By methylation a *p*-quinone, catechonetrिमethylene, is obtained. This seems to indicate the possibility of quinone formation by the oxidation of the catechol in plants. The easily decompd. peptizer, which consists of compds. easily split off from the polyphenols, is converted into humins while quinones containing several nuclei are more difficult to decompose. In tanning with gambier and catechu, the effect is not due to catechol but to dark polymers of catechol—quinhydrones. Compds. of a quinone character possess the property of forming colloidal peptized solns. to a high degree. Quinone is very easily oxidized by aq. permanganate solns. forming humins of high mol. wt. exactly as all vegetable tannins do. Colloidal complexes are obtained of unknown compn. and of undoubted tanning properties. Most theories of the quinone tannage claim that only those quinones with active oxygen are capable of tanning and dyeing. According to M.'s theory only those quinones which can form colloidal peptized solns. in aq. form are capable of tanning. Anthraquinone has no action on hide either in aq. or other solvents. Products containing anthraquinhydrone give weak tanning effects of quite a different nature from that of ordinary quinone. Phenanthraquinhydrone has only a weak tanning action on pelt, and the product can hardly be called leather. These expts. show that the far-reaching polymerization and oxidation processes usually associated with quinone and its homologs only take place with great difficulty with anthraquinone and phenanthraquinone, and colloidal peptized solns. are only produced under very special conditions. The quinone character of phlobaphenes is related to this question as they easily split off multinuclear quinones and are difficult to oxidize to colloidal humins. Tetrachloroquinone and turoquinone are very dissimilar to quinone in tanning action; they have not the tendency to form colloid complexes. Chloranil has no tanning action on pelt, but a trace of alkali added to a suspension in water produces some chloranilic acid which has a strong peptizing action on the rest of the chloranil. This forms a quinhydrone which gives humins on further oxidation. Such a chloranil suspension treated with alkali has a much greater action on pelt than all the quinones previously investigated. If pelt is treated with dil. aq. soln. of  $\alpha$ -diketone and then with very dil. caustic soln., aldolization ensues and further condensation to *p*-xyloquinone. There is no special tannage unless the pelt is left longer in the liquor so the pptd. quinones may be converted into colloidal peptized solns. Aldol gives a small portion of amorphous isomer which gives a leather exactly similar to formaldehyde leather. The author thus traces a direct connection between the aldehyde and quinone tannages. If ordinary quinone were stable in aq. solns. and formed no colloidal solns. it would have as little tanning action as anthraquinone. When benzoquinone has been converted into humins, only the peptizable substances are present, and no peptizer, with the result that it has no tanning action. But these humins have a very strong tanning effect if they are peptized by fresh additions of benzoquinone or hydroquinone, thus confirming the first assertion of the author's theory that only peptized substances can tan, but not the peptizer nor the peptized substances alone. If the peptization equil. is disturbed and the peptizer completely destroyed by oxidation, the tanning effect ceases to exist. The peptizers of the vegetable tannins consist of polyphenols which are easily oxidized to humins, while the peptized substances are stable multinuclear quinones of high mol. wt. which are not easily oxidized. If the air oxidizes the polyphenols into quinone-like humins, the equil. is disturbed the phlobaphenes are pptd. and there is a darkening

in color, owing to the adsorption of the humins formed from the peptizer. Benzoquinone does not give a true quinone tannage, but a humin tannage while quinonic phlobaphenes represent the true quinone tannage. The peptizer in vegetable-tanned leather is capable of oxidation to quinones and hence humins are formed. This change going on in the leather is the cause of the deterioration in vegetable tanned leathers.

J. S. ROGERS.

**Tanning materials in Germany.** ANON. *Halle aux cuirs* Sept. 8, 1918; *J. Am. Leather Chem. Assoc.* 13, 606-7.—The experience of tanners in Germany with Neradol indicates that while it tans rapidly certain precautions are necessary. Some skins are not suited for its use and the leather made with it disintegrates sooner or later. While this product helped materially to relieve the shortage of tanning materials in the Central Empires its use was forbidden by the Minister of War in Austria; in Germany the same would have happened, as a result of the complaints of its bad effects, if it had not been for the intervention of the Badische Aniline Works. This company controls Neradol and in 1916 sold 14,000,000 kg. at 55 marks per kg. As a compromise with the company, tanners can use now not over 30% of the quantity formerly used. After this ruling the Badische Works raised the price of Neradol from 55 to 90 marks per kg. and also tried to sell it as a tanning ext. under the name of "Tanol." Neradol has the fault of retaining  $H_2SO_4$  in the leather which causes irritation of the skin. A new product styled "Neradol-X" apparently overcomes this objection.

R. W. FREY.

**New methods of tannin estimation and their practical value as compared with the hide-powder process.** R. LAUFFMANN. *Collegium* 1918, 185-90; *J. Soc. Leather Trades Chem.* 2, 307(1918).—Zwick's process (*C. A.* 3, 2257) is useless when applied to mixed liquors, and the equiv. refractive indices before and after detannizing are influenced by the mode and temp. of leaching. Vanicek's assumption (*Collegium* 1909, 146) of a definite const. ratio between tannic acid and neutral matter in a tanning material is inadmissible, since the ratio alters on standing. Eglen's process (*C. A.* 8, 3251) is open to the same objection of varying proportion between the total solids and tannin. Gawaloski's modified process (*C. A.* 9, 3378) exts. resins and pectins with  $EtOH$  and  $Et_2O$  but with doubtful results, since insol. tans are counted as non-tans, and decompn. occurs when  $Cu$ -tannate is washed. Levi and Orthmann (*C. A.* 6, 814; 7, 1305, 1820, 3249) use inconst. factors. Kohn-Abrest (*J. Am. Leather Chem. Assoc.* 9, 260(1914)) and Singh and Ghose (*C. A.* 10, 1284) use very arbitrary methods. Errors in the hide-powder method are often due to fermentation of liquors or to improper treatment of the samples.

W. B. J.

**The detection of mangrove in mixture of tanning extracts—precision and caution.** E. SCHELL. *J. Soc. Leather Trades' Chem.* 2, 284-6(1918).—The detection of mangrove is still uncertain and erroneous conclusions are often made. The ethyl acetate figure is uncertain in mixts. and the amount of  $Cl$  and  $CaO$  is not positive proof of mangrove, since they could be introduced by use of waters containing  $Ca$  or  $Mg$  chlorides in making the exts. Color tests with mordanted strips of cotton are equally vague, and besides require much experience and many precautions. Colored ppts. from certain tests, such as Schell's cobalt reaction, do not permit the drawing of definite conclusions in commercial mixts. The following colored ppts. obtained by the author do not agree exactly with those given by Lauffmann in Stiasny's report on the differentiation of vegetable tanning materials (*C. A.* 6, 3540); ordinary quebracho, gray to dull gray; sulfited quebracho, light gray; mangrove, violet to dull violet; mimosa bark, light bluish gray; chestnut, olive-green; sumac, khaki; pine, dark sea green; divi divi, ashy green; valonia, deep green; cube, catechu reseda. S. tells how erroneous conclusions may be drawn from the cobalt reaction and certain exts. of solid quebracho poorly made

which react alkaline and contain appreciable quantities of alkali carbonates in the ash. As a control an alkaline ext. was made with a mixt. of  $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_3$  and solid quebracho ext. free from mangrove. This gave with the cobalt test the dull violet characteristic of mangrove. These abnormal alk. exts. even when acidified do not give the normal quebracho reaction. With normal exts. and in conjunction with the other characteristic reaction the cobalt test is positive but becomes unreliable with abnormal exts.

R. W. FREY.

The effect of impure kaolin on the determination of acid in tan liquors. DOUGLAS McCANDLISH AND FRED B. LEDERER. *J. Am. Leather Chem. Assoc.* 13, 570-3(1918).—Abnormally low acidity results of vegetable tan liquors, detd. by the A. L. C. A. method for total acidity, were upon investigation found to be due to the kaolin used, and principally to traces of  $\text{MgCO}_3$  and appreciable quantities of iron present as impurities in the kaolin. The kaolin was labeled "acid washed" but indicated an alkaline condition by its behavior on settling. A  $\text{H}_2\text{O}$  ext. of the kaolin was not alk. to phenolphthalein and was neutral to methyl orange and hematin. Water-sol. matter detd. from 20 g. in 200 cc.  $\text{H}_2\text{O}$ , was 2 g. per g. of kaolin. Data on AcOH solns. ranging from 0.12 to 1.2% acid show that large errors may be caused by using such a kaolin in acidity detns. The loss of acid ranged from 33 to 92% for 20 mins. standing and from 40 to 99% for 1 hr. With the lower concns. of acid the end-point with hematin was good but became more indefinite with increasing concns. A similar set of expts. with an old kaolin showed no loss of acid and good end-points. With the poor kaolin the unsatisfactory end-point was due to the iron, which if present in sufficient quantity will give with hematin in AcOH soln. a violet-blue color which could be easily mistaken for the neutral point. It would seem that a kaolin desirable for acidity detns. should pass the following tests: "Shake 15 g. of kaolin vigorously with 250 cc. of 0.02 N acetic acid and allow to stand 1 hr.; withdraw 50 cc. of the settled soln. and titrate with 0.1 N NaOH, using hematin as indicator. A titration of 10 cc. and the characteristic end-point indicates that the kaolin is free from alkaline matter and sufficiently free from iron to permit its use for the purpose in view."

R. W. FREY.

The chrome tanning industry. ANON. *Board of Trade J.; Chem. News* 117, 233-5(1918).—The trades in hides and skins from India was largely with the U. S. and the Central Empires instead of with the United Kingdom. This is due in great measure to the fact that in the U. S. and Germany tanners have perfected and successfully used chrome-tanning processes much more extensively than have the English tanners. The tanning industry in the United Kingdom and in India favors development of chrome tanning in these countries. Up to the present time these countries have given preference to vegetable-tanned leather. The development of the one- and two-bath chrome-tanning processes is briefly reviewed. Rapidity of tannage, waterproofness, and compact leather after fat liquoring, and greater tensile strength are given as advantages of chrome-tanned leather.

J. S. ROGERS.

Investigation of one-bath chrome liquors. J. R. BLOCKEY. *J. Am. Leather Chem. Assoc.* 13, 573-81(1918).—See C. A. 12, 2708.

R. W. FREY.

A study of one-bath chrome liquors. JOHN ARTHUR WILSON. *J. Am. Leather Chem. Assoc.* 13, 566-9(1918).—A criticism of Blockey's article (C. A. 12, 2708, or preceding abstr.) in which is criticized the work of Thomas and Baldwin (C. A. 12, 2461). Chrome liquors are very complicated systems and not as simple as Blockey's explanations would indicate. His method for detg. "basicities" by means of the hydrogen electrode appears to have no foundation except for systems so const. as to need no such control. It assumes that the p. d. are functions only of the "basicity" and concn. of  $\text{Cr}_2\text{O}_3$ . Wilson and Kern (C. A. 11, 2740) show that it is possible to have 2 Cr liquors identical in "basicity" and  $\text{Cr}_2\text{O}_3$  content in one of which the Cr may be on the point

of pptn. while the other may require considerable alkali for pptn. because of the presence of neutral salts such as NaCl or Na<sub>2</sub>SO<sub>4</sub>. Further data on the "neutral salt effect" given in the second paper by Thomas and Baldwin (C. A. 12, 2460) show that it is possible to keep the "basicity" and the concn. of Cr<sub>2</sub>O<sub>3</sub> const. and vary the p. d. through wide limits. In such studies of Cr liquors more work should first be done on the effect of neutral salts on pure acid solns. Blockey's claim that the basicity value of 0.770 given by T. and B. for Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> should be 0.633 seems to be without grounds.

R. W. FREY.

**Note on the statement of basicity of chrome liquors.** H. R. PROCTER. Intern. Research Lab. *J. Soc. Leather Trades' Chem.* 2, 259(1918).—Procter does not consider the American way of stating basicity, e. g., Cr<sub>2</sub>O<sub>3</sub>/SO<sub>4</sub> or the European method as parts SO<sub>4</sub> to 52 parts Cr, as quite scientific or sufficiently general, since chrome liquors often contain chlorides and salts of other acids besides sulfuric. He suggests that basicity be stated "as the proportion of basic valences to acid ones, the normal salt being unity, thus Cr<sub>2</sub><sup>VI</sup>(SO<sub>4</sub>)<sub>3</sub><sup>VI</sup> would be 6/6 = 1; and Cr<sup>III</sup>Cl<sub>3</sub><sup>III</sup> would be 3/3 = 1; CrCl<sub>3</sub>OH and Cr<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>(OH)<sub>2</sub> would be 3/2 = 1.5; bisulfates and dichromates would be 0.5, etc." For the present this method of stating might be denoted by affixing basic to the figures. For chrome salts the rule would be that the wt. of Cr<sub>2</sub>O<sub>3</sub> found (in mg.) should be divided by ((152/6) × cc. N alkali used in neutralizing the acid).

J. S. ROGERS.

**Sodium sulfide in lime liquors.** H. HAYES. *J. Soc. Leather Trades Chem.* 2, 258(1918).—H. gives results comparing the method for the detn. of sulfide in lime liquors described below, with the ammoniacal zinc method described in Procter's *Leather Chemists' Pocket Book*. The authors method is as follows: Add excess of standard ZnSO<sub>4</sub> soln. to a known quantity of filtered lime liquor in a graduated flask, acidify with CH<sub>3</sub>COOH, make to vol., mix, filter, take aliquot of filtrate, add 2-3 cc. concd. HCl and 2-3 g. of NH<sub>4</sub>Cl, warm to 40° and titrate with K<sub>2</sub>Fe(CN)<sub>6</sub> soln., using uranium acetate as external indicator (Clowes and Coleman's *Quant. Analysis*). If 1 or 2 min. are allowed between the addition of reagent the end-point is quite distinct. The results obtained on lime liquor by H.'s method were 1.68 g. Na<sub>2</sub>S per l. as compared with 1.65 by the other method, and 4.73 g. Na<sub>2</sub>S per l. as compared with 4.68 g. per l. on a simple sulfide soln. H. believes his method, called the "Excess Zinc Method," is desirable when limes containing only 0.1% Na<sub>2</sub>S crystals are to be analyzed and accurate results are wished.

J. S. ROGERS.

**The Tilston-Melbourne liming process.** ANON. *Leather Trades Rev.* 51, 738-9 (1918).—This process has been established as a practical success in the United Kingdom. A cross-section view of the preferred form of installation is given. The pits should preferably be constructed to hold about 50 hides each and should have concave bottoms to assist the upward movement of the liquors. The usual pit can, however, be used. Along the full length of the bottom of each pit is a paddle arrangement which keeps the lime liquors constantly in motion, thus giving all parts of every hide a uniform liming. The paddle also on the forward stroke strikes the bottom edges of the hide giving a "bellowsing effect" which overcomes any tendency of the flesh sides to stick together. The machinery is run 5 hrs. each day, the liming is done in 2 stages, the first being 2 days with the old lime and the second 3 days with new lime and sulfide. The used lime liquors are drawn off from the bottom. By this process only 3 1/4 lbs. of lime per hide are used as against nearly 10 lbs. per hide with the usual system. Excellent results are obtained, the hair yielding to the slightest pressure, the grain being firm, and the pelt very uniformly and satisfactorily plumped. Besides the very material reduction of labor and time in the lime yard, there is considerable saving of hide sub-

stance, no danger of lime stains, and none of the heavy work of cleaning the lime bottoms from the stale pelts is necessary.

R. W. FREY.

The profitable recovery of proteins from tannery waste waters. C. LEE PECK. *J. Am. Leather Chem. Assoc.* 13, 417-28(1918).—P. describes tests made at Procter-Ellison tannery. The treatment consists of (I) screening, recovering hair, fleshings and undissolved hide material; (II) hydraulic classification, elimination of sand, silt and undissolved lime; (III) pptg. and recovering the dissolved protein substances, and settling out the finely divided cellular material, using acid to neutralize; dissolving and removing lime salts from the ppt.; (IV) prepg. the ppt. for the market. The results obtained in one month's test were: (a) One sq. ft. of settling area recovered 81.6% of suspended solids from 132 gals. of raw sewage daily. The effluent containing 163 pts. per million of suspended solids. (b) One sq. ft. settling area recovered 90.4% of suspended solids from 86 gals. of raw sewage daily. The effluent containing 158 pts. per million of suspended solids. Analyses of effluent according to Am. Public Health Assoc. methods are given. For each side of sole the vol. of sludge recovered was 4.6 gal., area of sludge bed required for each daily side was 10.8 sq. ft., and vol. concn. on sludge was 6.1. The wt. of dry solids was 1.56 lbs. The ammonia value at \$3.50 per unit was \$0.01767. The estd. cost of plant for sewage treatment, sludge recovery and drying was \$7.50 per daily side. The estd. cost of operation, including amortization, interest and freight of sludge to market and 10% losses was \$0.01. Three million gals. of tannery waste waters were treated. 37,000 gals of sludge were recovered, which contained about 14,500 lbs. of dry solids. The dry solids contained 6.47% N as  $\text{NH}_3$ . The returns to the tanner would be about twice the cost to the tanner.

J. S. ROGERS.

Influence of iron and organic matter on the iodometric estimation of chromium (LAUFFMANN) 7. Tintometry (SCHELL) 2.

Artificial sole leather. E. W. ERICSSON. Swed. 44,026, May 8, 1918. Addition to 43,588 (C. A. 12, 1604). In the manuf. of sole leather substitute by known processes, substituting seal fat, train oil, or linseed oil for the grease commonly used.

Tanning. A. TURNBULL and T. B. CARMICHAEL. U. S. 1,288,458, Dec. 17. Strong tanning solns. either of vegetable or mineral tanning compds. are mixed with about 10% of starch which has been gelatinized by heating to about 80°, in order to prevent to rapid tanning and hardening of the exterior portion of the hide and to secure a more uniform action of the liquor upon the entire thickness of the hide.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

A review of the synthesis of rubber. ANON. *Caoutchouc et gutta-percha* 15, 9598-9601, 9624-6(1918).—A review.

JOHN B. TUTTLE.

A comparison of the effects produced by organic accelerators in the vulcanization of rubber. A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9635-7(1918).—D. gives the results of some expts. comparing the action of inorg. accelerators with org. The compd. used contained 90 parts pale crepe, 10 parts S, and small quantities of accelerators and was vulcanized in steam 1 hr. at 15 kg. pressure. A table of the coeffs. of vulcanization shows that the org. accelerators produce a higher coeff. and a greater resistance to elongation.

JOHN B. TUTTLE.

**Vulcanization accelerator.** A. HUTIN. *Caoutchouc et gutta-percha* 15, 9596-8 (1918).—See C. A. 12, 103. JOHN B. TUTTLE.

**Vulcanization researches.** B. J. EATON. *Agr. Bull. Federated Malay States* 6, 422-3 (1918); cf. C. A. 12, 1011.—A summary of the work of the Agricultural Department at Kuala Lumpur for the first half of 1918. Attention is called to the injurious effect caused by the use of alum in coagulation. The effect of certain substances on the rate of vulcanization was studied. Starch was without effect, but boric, tannic, molybdic and phosphotungstic acids all had a retarding effect when used to the extent of 1 to 2%. The larger amts. have a greater effect than the smaller, and the effect varies with different kinds of rubber. JOHN B. TUTTLE.

**Reclaiming of vulcanized rubber.** A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9646-8 (1918).—D. considers that in vulcanization, the S is first absorbed by the gum, after which a chem. reaction takes place. According to this idea one would find in vulcanized rubber (1) chemically combined rubber and S, giving a hydrochloride insol. in  $\text{CHCl}_3$ ; (2) stable rubber, containing S which can be extd. by acetone; it forms a hydrochloride insol. in  $\text{CHCl}_3$ ; (3) metastable rubber, in which there is only a physical mixt. of rubber and S; it forms a hydrochloride sol. in  $\text{CHCl}_3$ . Since the value of reclaimed rubber depends largely on the amt. of metastable rubber, D. has developed a method to det. the % of this material. Grind the rubber to pass 120-mesh sieve and treat with anhydrous HCl for 24 hrs. The temp. in the reaction flask must not exceed  $35^\circ$ . Wash with hot, then cold water, hot 90% EtOH, then cold EtOH, dry at  $60^\circ$  and cool in a desiccator. The product is a white powder, insol. in EtOH,  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{C}_6\text{H}_6$ , and  $\text{CS}_2$ . It contains the hydrochlorides of polyprene sulfide, stable and metastable rubber. A weighed portion is extd. with  $\text{CHCl}_3$ , the residue dried at  $60^\circ$  and weighed, the loss being metastable rubber. The dried ext. can be weighed, or treated with pyridine on a steam bath for 6 hrs. using a reflux condenser, filtered on a tared filter paper, washed with hot, then cold acetone, then 95% EtOH. It is dried at  $60^\circ$  and weighed. The rubber thus obtained is elastic, and sol. in all the usual rubber solvents. JOHN B. TUTTLE.

**Statistics on rubber plantations in the Middle East.** HENRI JUMELLE. *Caoutchouc et gutta-percha* 15, 9533-42 (1918).—A review of the growth of the rubber plantation industry in Ceylon, Malay, Burma, Netherland Indies and nearby territories. JOHN B. TUTTLE.

**The influence of dilution water on the latex, with reference to premature coagulation while diluting to standard strength.** J. C. HARTJENS. *Archief v. d. Rubber-cultuur in Nederl.-Indië* 2, 163-86; *Chem. Weekblad* 15, 1390-1 (1918).—Premature coagulation while dilg. to 15% strength is largely due to Ca salts in the water. If the only available water supply contains much Ca, it is even better to omit entirely the diln. to standard strength. Expts. with anti-coagulants showed that NaOH, PhOH and Na oxalate are the most effective ones. JULIAN F. SMITH.

**Flowers of sulfur and sublimed sulfur.** NOYER. *Caoutchouc et gutta-percha* 15, 9661-3 (1918).—The varying descriptions given to flowers of S by different authors suggest to N. that a real difference exists between sublimed S and flowers of S. He believes that the insoly. of flowers of S in  $\text{CS}_2$  suffices to distinguish the two kinds. For rubber manuf. flowers of S should possess 33% insol. in  $\text{CS}_2$ , and the % insol. in  $\text{CS}_2$  should tell the amt. of flowers of S in sublimed S. JOHN B. TUTTLE.

**Regenerating rubber.** E. ZAPPERT. *Holl.* 2,486, Oct. 1, 1918. Old rubber material contg. vegetable fibers is treated in a closed vessel by heating with a mixt. of  $\text{H}_2\text{SO}_4$  and a resin oil from which the turpentine has been previously removed by distg.



# CHEMICAL ABSTRACTS

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## I. APPARATUS.

L. C. JONES.

**Platinum economy in the industrial chemical laboratory.** E. C. MUESER. *Chem. Met. Eng.* 20, 69(1919).—A general review on the use and care of Pt ware. No new matter. F. W. SMITHER.

**Hydraulic separation as applied to the recovery of fine coals, shales, and clays.** JOHN M. DRAPER. *Trans. Eng. Ceram. Soc.* 17, 213-25(1918).—A new hydraulic app. is described which has been used successfully in recovering fine-grained coal (down to 100 mesh) from the accompanying shale. It consists of a vertical tower in which the descending charge meets a rising flow of water, the rate of flow being regulated to accomplish the floating of the particles of lower sp. gr. while the heavier particles sink. Materials with sp. gr. differences as low as 0.06 can be sepd. The app. seems applicable to clay purification. C. H. KERR.

**Electrical apparatus for boiling water.** F. BURMANN. *Electrician* 81, 740; *Elektro-techn.* Z. No. 13(1918).—Two or more C plates or cylinders sepd. by insulating rollers are immersed in the water to be heated. Tests have shown that it requires 1 hr. to heat 300 l. of water to about 30°. Twenty amps. at 220 v. were required. This gradually rises to 34 amps. By cutting out plates, any temp. desired may be maintained. Tests were also made with cylindrical electrodes on smaller quantities. W. E. R.

**Sumner elastic-limit recorder.** J. L. JONES AND C. H. MARSHALL. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 478-83(1918).—A device consisting of a semi-automatic solenoid is described. It is accurate, rapid, and enables one man to do the work that has usually required 3 men. It has been used in connection with the Ewing extensometer over a considerable period of time and the data obtained have been uniformly satisfactory. One especially valuable feature is the fact that the card on which the test is made can be filed as a permanent record. S. G. SIMPSON.

**Optical pyrometer.** ANON. *Elec. Rev.* 74, 159(1919).—This portable app. has a telescope which brings the image of the heat source in the plane of a carefully aged W lamp filament. A storage battery current through the lamp is adjusted until the filament blends with the image of the heat source. The temp. of the filament (or heat source) is shown on the scale of a milliammeter in series with the lamp. The milliammeter reads degrees directly, or the temp. corresponding to the current may be read from a calibrated curve supplied with the instrument. The telescope weighs but a few ounces. A case, containing the battery, rheostat and milliammeter weight about 10 lbs. and can be slung over a shoulder. The temp. range is from 600° upward. C. H. ELDRIDGE.

**Photometric apparatus for measuring the illuminating value of fluctuating sources of high candle power.** A. P. TROTTER. *Gas J.* 144, 658(1918).—The app. was originally devised for the English Ministry of Munitions for comparing the illuminating values of flash lights, flares, star-shells, etc. Conditions demanded a photometer which should be portable, self-contained, direct-reading, requiring no adjustment during use, suitable for either outdoor or indoor work, and requiring no special training or

photometric knowledge for operation. Two such photometers were produced; one by J. G. Clark, the other by J. S. Dow. The Clark instrument is a tube 25 in. long by 3 in. diam., the interior whitened and illuminated by an elec. glow lamp placed at one end. A slot 0.2 in. wide extending nearly the whole length of the tube is covered with a strip of thin metal having perforations preferably in form of letters. This strip is painted white and receives the illumination to be measured. In reading the illumination a point is estd. where the brightness of the interior of the tube is equal to that of the exterior strip of metal, these readings being later compared with a previously prepared calibrated scale registering the illumination of each perforation. The lamp is supplied by a portable battery and so long as the voltage is constant the calibration may be depended upon. The disadvantage is that the illumination falls off rapidly from the bright end to the darker end. The Dow instrument is a box 11 × 11 × 4 in. The observer looks through an opening in one side of the box and sees on the farther side a grid of 14 slots in a white card. The grid is illuminated by an elec. lamp placed on one side of the box and screened from the observer. Readings are made by looking through the slots at a detached test screen which receives the illumination to be measured. As in the other photometer, a point is taken where the brightness of the slotted card appears to be equal to that of the test screen. A graduated screen gives a measure of the illumination thus detd. A range much wider than that afforded directly by the slots is obtained by using test screens of various tints of gray placed about 1 m. distant. If the observer finds that the balancing point is near the darker end, he can at once direct his view to an adjacent screen of a gray tint. The balancing point becomes shifted to the other end of the scale. Each tint has a definite multiplying factor found by expt.

J. L. WILEY.

VIGREUX, HENRI: *Le soufflage du verre dans les laboratoires scientifiques et industriels*. Preface by M. Haller. Paris: H. Dunod et E. Pinat. 248 pp. 14 francs 40. For review see *L'industrie chimique* 6, 32(1919).

**Drying apparatus.** O. H. ABBOTT. Brit. 120,635, Nov. 21, 1917. A drying chamber provided with trays in tiers is fitted with a series of baffles projecting approx. horizontally from the wall, each baffle being in line with the bottom of a tray. The baffles are of graduated lengths, the bottom one being the shortest so that the inlets to the trays are successively reduced in width.

**Extraction apparatus.** J. I. THORNYCROFT. Brit. 120,448, Nov. 12, 1917. A diffuser app. for extg. sol. substances from vegetables, or sugar sirup from sugar beet, consists of a vertical column up which the vegetable substance is forced by a piston working in a vertical cylinder at the base of the column, while the extg. liquid passes down the column. Constructional details and operation are specified.

**Oil-filter.** G. W. WILMOT. U. S. 1,287,160, Dec. 10.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

The work of Charles Gerhardt. M. TIFFENEAU. *Rev. scientifique* 55, 586, 750 (1917); 56, 168(1918). E. H.

Physical chemistry and its bearing on the chemical and allied industries. JAMES C. PHILIP. *J. Roy. Soc. Arts* 67, 94-102, 108-18, 122-31(1919). E. H.

Chemistry, chemists and the war. P. CARRÉ. *Rev. sci.* 56, 233-6(1918).

E. H.

Science and the after-war period. GEORGE K. BURGESS. *J. Wash. Acad. Sci.* 9, 57-70(1919); *Sci. Monthly* 8, 97-108(1919). E. H.

Chemistry at the Indian Institute of Science, Bangalore. *J. Soc. Chem. Ind.* 38, 4-5R(1919). E. H.

Inter-Allied conference on international organizations in science. C. G. K. *Nature* 102, 325-7(1918).—Minutes of the conference of the Committee of Inquiry held in Paris, Nov. 26-29 (1918). This committee was constituted at a meeting of representatives of academies of the Allied countries and of the United States in London, Oct., 1918, for the purpose of prepg. a general scheme of international organizations to meet the requirements of the various branches of scientific and industrial research, including those relating to national defense. Definite progress was made in the institution of three associations: (1) astronomy, (2) geophysics; and (3) union of chem. societies. W. H. ROSS.

An institute of physical and chemical research for Japan. ANON. *Nature* 102, 294-5(1918).—A review of the purpose and scope of the Institute of Physical and Chemical Research in Japan which came into existence as a legal body in March, 1917. W. H. ROSS.

The Manchester exhibition of British science products. ANON. *Nature* 102, 354-6(1919).—The exhibit to which about 240 firms contributed consisted of such products as chemicals, dyes, intermediates used in organic synthesis for dye manufacture and for explosives, precision machinery, measuring instruments, physical app., etc. W. H. ROSS.

The purification by sublimation and the analysis of gallium chloride. THEODORE W. RICHARDS, W. M. CRAIG AND J. SAMASHIMA. *J. Am. Chem. Soc.* 41, 131-2(1919).—A new method for the purification of Ga salts was employed, involving first the burning of Ga in pure, dry Cl, then fractional distn. of the chloride in pure Cl, next in N, finally sublimation *in vacuo*. The app. was devoid of rubber connections or ground glass joints. Examn. of the product in a Hilger wave-length spectrometer showed no trace of impurity. In a preliminary detn. of the at. wt., the values 70.09 and 70.11 were obtained. The work is being continued. R. E. HALL.

The purification of gallium by electrolysis, and the compressibility and density of gallium. THEODORE W. RICHARDS AND SYLVESTER BOYER. *J. Am. Chem. Soc.* 41, 133-4(1919).—Sepn. of Ga from In by means of the different solubilities of the hydroxide in caustic alkali was tested without success. More promising results were obtained by the electrolytic method. Ga obtained in this manner from material previously purified by the hydroxide method melted at 30.8°. The compressibility of pure solid Ga is  $2.09 \times 10^{-8}$ ; contaminated with a few % of In,  $1.97 \times 10^{-8}$ ; of the liquid at 30°,  $3.97 \times 10^{-8}$ . The densities of solid and liquid Ga are, resp., 5.885 and 6.081. R. E. H.

Some physical constants of mustard "gas." LEASON H. ADAMS AND ERSKINE D. WILLIAMSON. *Geophys. Lab. J. Wash. Acad. Sci.* 9, 30-5(1919).—The values of  $\Delta v$  as a function of pressure are expressed by  $-\Delta v/v_0 = 0.118[1 - e^{-0.364 \cdot 10^{-3}(P - P_0)}]$  in which  $v_0$  is sp. vol. at 31.5° and  $P_0$  is 392 megabars. From this, the compressibility at 0, 1000, and 2000 megabars is, resp.,  $49.5 \times 10^{-8}$ ,  $34.4 \times 10^{-8}$ , and  $23.9 \times 10^{-8}$ . The f. p. ranges from 13.9° at 1 megabar to 38.9° at 1800 megabars. The vol. change on freezing at various temps. and pressures is also noted. From these data, the latent heat of melting is 25 cal. per g., and the f.-p. lowering const. is 6.5° (1 mol. solute per 1000 g. solvent). At 38°, no different forms of solid mustard gas were found up to 12000 megabars. R. E. HALL.

The cryoscopic constant of asymmetric heptachloropropane,  $\text{CCl}_2\text{CCl}_2\text{CCl}_2\text{H}$ . J. BÖRSSEN AND J. BENEDICTUS. *Rec. trav. chim.* 37, 121-9(1918).—Heptachloro-

propane (*a*) seemed suited as a cryoscopic solvent because it m. about 29°, it is easily purified by distn. and it is not hygroscopic. The cryoscopic const. was found to be about 120. The soly. of HO derivs. and acids in (*a*) is not very great. For acids (*a*) is a pronounced associating solvent: so pronounced that acids like undecylenic, lauric, palmitic and stearic form double mols. The alcs. show the same anomaly. At very great diln. the mol. wt. is nearly normal but rises quickly with the concn. The hydrocarbons, the chlorides, the amines and the esters behave normally. (*a*) is recommended as a cryoscopic solvent for all these compds. except alcs.: with the acids the mol. value may be obtained by dividing by two. The (*a*) used was purified by distn. until the f. p. was const. within 0.05°. The Beckmann app. with a motor-driven Ni agitator was used. 75 compds. were investigated and the numerical data are given in tables and graphs. The graphs show that the alcohols show an increase in the association with the temp. as well as with increasing mol. wt. The tertiary alcohols are little or not at all associated.

E. J. WITZEMANN.

**Critical phenomena.** WILLIAM R. FIELDING. *Chem. News* 117, 379-83(1918).—In a paper not yet published F. has proved that for inorg. elements and compds. the relation  $C. T. = (1.714 \times B. P.) + 3.3^\circ$  (all temps. being on the abs. scale). If crit. temps. are plotted against crit. pressures, not all substances lie on one curve; there appears to be a separate curve for each group of elements or similarly constituted compds. The formula  $(C. T. + 236.2)/\sqrt{C. P.} = 70.9$  applies to the elements and a similar formula  $(C. T. - X)/\sqrt{C. P.} = k$ , where *X* and *k* depend on the series to which the substance belongs, applies to inorg. compds. E. Ariès has calcd. the crit. data of Hg vapor from the behavior of Kr, A, and Xe, the first two of which, like O and He, behave in an irregular manner and do not lie on the crit. curve. The formula  $C. T. \times \sqrt{C. P.} = \text{const.}$  applies to org. compds. The C. T. and C. P. of compds. are not the sums of the C. T. and C. P. of their constituents; but in inorg. compds. as the C. T. rises the C. P. rises and the value of R falls (in any particular series of compds.)  $R = C. P.$  of the substance calcd. from its constituents divided by the C. P. of the substance. In inorg. compds. as the C. T. rises the C. P. falls and the value of R rises (in any particular series of similar compds.). In the case of the benzene derivs. the value of  $C. T. \times \sqrt{C. P.}$  is highest for the ortho-position and lowest for the para-position. The value of  $C. T. \times \sqrt{C. P.}$  is slightly higher for the normal than for the iso-position. As the number of benzene rings in a compd. increases so does the value of  $C. T. \times \sqrt{C. P.}$ . The substitution of one phenyl radical for H in a methane mol. raises the value of  $C. T. \times \sqrt{C. P.}$ ; the introduction of a second phenyl radical raises it still further. The introduction of one methyl radical into the benzene ring reduces the value of  $C. T. \times \sqrt{C. P.}$ ; a second methyl radical (in the ortho-position) causes no further change; a third methyl radical probably causes no further change (if the methyl radicals are in the 1,2,3-positions). In the case of the benzene ring with a side chain the value of  $C. T. \times \sqrt{C. P.}$  will probably tend to become const. when the possibility of isomerism has become established. Numerous tables of crit. data are given exemplifying the above conclusions.

F. P. PHELPS.

**The characteristic equation of fluids.** PIERRE WEISS. *Compt. rend.* 167, 364-6 (1918); cf. *C. A.* 12, 2469.—Van der Waals' equation assumes that the "internal pressure" is proportional to  $1/v^2$ . W. has used a more general expression,  $\pi = a/q^\eta$ , where *v* is the vol.  $\eta$  is found by plotting the log of the internal pressure against  $\log 1/v^2$ . Curves are shown for isopentane, argon and ethylene. The curves are straight lines, with sudden changes in slope corresponding to different values of  $\eta$ . For ethylene a sep. value of  $\eta$  is given for use at high temps. The complete equation of state is now  $(p + a^\eta/v)(v - b) = \zeta RT$ . For isopentane,  $\eta = 1.65$  and 2.5;  $\zeta = 1.38$  and 1.20. For

A,  $\eta = 2.09$  and  $1.56$ ;  $\zeta = 1$  and  $1.56$ . For ethylene  $\eta = 2$  and  $1.5$ ;  $\zeta = 1.07$  and  $1.43$ ; while at high temps.  $\eta = 1.73$  and  $\zeta = 1.20$ . F. C. HORR.

Studies on the coagulation of colloidal solutions by complex metallic salts. I. Coagulation of arsenious sulfide by complex cobalt salts. K. MATSUNO. *Tokyo Kwagaku Kawai Shi (J. Tokyo Chem. Soc.)* 39, 908-32(1918).—A certain vol. of the complex Co salt soln. of various concns. was added to 1 cc. of colloidal  $As_2S_3$  soln. (0.0376 mol.) and the threshold value, or the concn. of the electrolytes at which the coagulation of the colloidal soln. begins, was detd. The following results show the relation between the valency of complex positive ions and their threshold values:

|                      |           |          |           |           |   |            |
|----------------------|-----------|----------|-----------|-----------|---|------------|
| Valency.....         | 1         | 2        | 3         | 4         | 5 | 6          |
| Threshold value..... | $1/187.4$ | $1/3000$ | $1/18000$ | $1/53230$ | — | $1/240000$ |

In the case of common salts, however, varying results were obtained. It might be ascribed to the fact that equiv. solns. do not actually yield ions of the same valency owing to the formation of some complex salt. From the exptl. data was deduced the equation  $S_n = S_1 \times 1/n^4$ , in which  $S_n$  is the threshold value of  $n$ -valent complex salt. By the study of the threshold value, the author explained the chem. change of aquo Co or other complex salts in their aq. soln. S. KOMATSU.

The rhythmetic precipitation of silver chromate. TOKIHARU OKAYA. *Phys. Inst., Imperial Univ., Tokyo. Proc. Tokyo Math. Phys. Soc.* [2] 9, 442-62(1918).—A revision and extension of the theoretical treatment of the second Liesegang phenomenon by G. Pierce and H. Morse using the latter author's exptl. data. P. and M.'s theory was based simply on Ostwald's pptn. theory. Owing to the effect of the diffusion of a Ag salt in gelatin containing chromate, there may occur at some place a strength of the soln. which is supersatd. with respect to the salt and yet the pptn. does not take place until the concn. oversteps some definite value which may be called the metastable limit. In O.'s opinion it is not sufficient to cause pptn. for the concns. of the reacting ions to attain the metastable limit, but it is necessary that the amts. of their accumulation shall exceed a certain limit. As soon as the amts. of accumulation attain this limit the pptn. will begin. This limit is called the "separation limit." The mathematical theory of rhythmetic pptn. is worked out in detail, using the "separation limit" as an assumption. F. P. PHELPS.

The multarotation of gelatin and its significance in gelation. C. R. SMITH. *J. Am. Chem. Soc.* 41, 135-50(1919).—From studies of the effect of temp. on the multarotation of gelatin solns. the author concludes that "there probably exist 2 forms of gelatin, one, which has been designated sol form A, stable above  $33^\circ$  to  $35^\circ$ , and the other, the gel form B, stable below  $15^\circ$ ." He develops a formula for what he believes to be a bimol. reaction, with an equil. thermally reversible between these limits. Increase in levorotation parallels increase in viscosity, and is held to indicate increasing formation of gel form B. Gelatin sols dried above  $35^\circ$  and gels dried below  $15^\circ$  give different solid forms. JEROME ALEXANDER.

The state of substances in solution in absolute sulfuric acid. VIII. Reply to A. Hantzsch. G. ODDO with A. CASALINO. *Pavia. Gazz. chim. ital.* 48, I, 17-44(1918); cf. C. A. 2, 930, 1773, 1775; 3, 604, 1607; 4, 533; 5, 879, 1744, 3798; 12, 1180.—This constitutes a complete and detailed reply to criticisms of Hantzsch of long standing. In the latter part serious accusations are made against the editor of *Z. physik. Chem.* The paper is divided into 6 sections. In the first 2 sections H.'s cryoscope and some typical runs with it are described. O. built an app. exactly like that used by H. and found it unsatisfactory for a number of reasons. Moreover the consts. obtained for picric acid, phthalic anhydride,  $Me_2SO_4$  and  $C_6H_5(NO_2)$ , in abs.  $H_2SO_4$  when detd. with use of H.'s app. and method are quite irregular. O. offers to lend the app. to

anyone wishing to repeat the detns. In the section on solvent O. replies in detail to all of H.'s misunderstandings and errors largely by repeating and emphasizing material previously published. In the section on the const. O. states that H. has attempted to correct his data on the cryoscopic const. using the same compds. used in part by O. The expts. were repeated by O. in his own cryoscope and show again that in abs.  $\text{H}_2\text{SO}_4$ ,  $\text{C}_4\text{H}_2(\text{NO}_2)_2$ , anhydrous oxalic acid, phthalic anhydride and  $\text{Me}_2\text{SO}_4$  show evidences of decompn. as indicated by the irregular values obtained for  $K$ . The mean value obtained for  $K$  was 68.9. In the section on ethers and esters, O. critically examines H.'s criticism of his own interpretation of the behavior of these compds. in abs.  $\text{H}_2\text{SO}_4$  and experimentally shows the latter to have been mistaken. The last section consists of replies to H.'s criticism on the calcn. of mol. percents and concns. O. in a final section airs his grievance with the *Z. physik. Chem.* and volunteers to substantiate his claims with documentary evidence.

E. J. WITZEMANN.

**Remark on the internal friction of quartz filaments at low temperatures.** C.-E. GUYE AND P. BARBIER. *Arch. sci. phys. nat.* 46, 326-8(1918); cf. *C. A.* 10, 2431.—Guye and Einhorn have shown previously that the internal friction of a quartz filament, as measured by the logarithmic decrement of the torsional oscillations of the filament, diminishes rapidly with falling temp. down to  $-79^\circ$ , after which there is little change. In the present paper an attempt is made to answer the question as to whether or not the extremely slowly diminishing damping of the oscillations below  $-79^\circ$  may have been a residual external damping which resulted either from the friction between the moving parts and the residual gas present in the app., or from some force transmitted to the support of the filament during its oscillations. Expts. now made show that the decrement at  $0^\circ$  in air (1 cm. pressure) is the same as in  $\text{CO}_2$ , whereas, if the damping were due to the gas the decrements should differ by 17%. Although the action of an external force on the suspension is not yet excluded, it seems probable that the slow diminution of the internal friction of quartz filaments below  $-79^\circ$  is a fact, and especially so since other properties of quartz filaments, such as the dilation and coeff. of elasticity, are abnormal at low temp.

R. H. LOMBARD.

**The thermal conductivity of air.** E. O. HERCUS AND T. H. LABY. *Proc. Roy. Soc. London (A)* 95, 190-210(1919).—Out of 8 detns. the two which were considered most reliable differed by 1.2%. Considerable discussion is given of the results of others, and of their bearing on the theory.

W. P. WHITE.

**The freezing points of mixtures of phenol, *o*-, *m*- and *p*-cresol** (DAWSON, MOUNTFORD) 7. **Influence of some nitrogen derivatives on the conductivity of boric acid** (BÖSEKEN, *et al.*) 10. **The hydrolysis of soap solutions** (MCBAIN, BOLAM) 27.

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#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

Henry T. von Boettinger. K. ELBS. *Z. Elektrochem.* 24, 183; illus.—An appreciation. C. G. F.

Development of hydroelectric resources in eastern United States. D. H. COLCORD. *Elec. Rev.* 74, 207-9(1919).—A review. C. G. F.

The development of hydroelectric power in Canterbury (New Zealand). L. BIRKS. *Electrician* 82, 116-8(1919).—A detailed account of the new undertaking.

The electrochem. industries that have sprung up include an electrolytic detinning plant. Caustic soda, Cl, carbide and elec. steel plants are about to be started. C. G. F.

**Electric furnace installation.** T. R. HAY. *Iron Age* 101, 735(1918).—When the use of an elec. furnace is being contemplated, it is important to give careful attention to the consideration of (1) ample finances, (2) proper conception of the function of an elec. furnace, and (3) correct decision as to the proper size and type of furnace.

W. E. RUDER.

**Results with a Rennerfelt furnace.** O. FRICK. *Iron Age* 101, 563(1918).

C. G. F.

**Developments in the Rennerfelt furnace.** H. A. DE FRIES AND J. HERLENTUS. *Iron Age* 103, 190-1(1919).—A round shell with a removable dome-shaped roof is now employed which permits a better heat distribution and a more accessible hearth. A number of improvements have been made in the electrode mechanisms. Since it had been found that the highest efficiency was obtained with the furnace at a certain fixed and const. distance between the tips of the electrodes and the top of the charge, the electrodes of the newer furnaces have been made so that they can tilt in a vertical plane, thus allowing the electrodes to follow the charge as it melts down. The most important improvement is the tilting of the side electrodes to such an extent that arcing to the slag can take place. The time for desulfurizing and killing in the basic process has been considerably shortened and a superior steel obtained, through decreasing the depth of the bath. The larger furnaces are now furnished with a cradle and rack.

H. JERMAIN CREIGHTON.

**Triplex process of making electric steel.** T. W. ROBINSON. *Iron Age* 101, 1471-7 (1918); *Chem. Met. Eng.* 19, 15-20(1918).—A description of the large new plant of the Illinois Steel Co. at South Chicago where three 25-ton Héroult furnaces are now in operation. These produce about 12000 tons of steel per mo. This combined with the two old furnaces give the plant a capacity of about 17000 tons of elec. steel per mo. With 4 furnaces working on the triplex process load factors of 75 to 80% are not unusual. The furnaces are operated on a reducing slag only, and after the steel is thoroughly dead-melted, the current is reduced to obtain a proper pouring temp. All pouring is subject to careful pyrometric control. The steel is teemed in inverted molds with refractory hot tops. In transferring open-hearth metal to the elec. furnace, it is the aim to have the metal slightly lower in C and Mn. A table of test results shows that elec. steel is very much superior to open-hearth steel in ductility and resistance to shock at temps. of  $-18^{\circ}$  and lower. At temps. above this, the open-hearth steel is somewhat superior. MATHEWS and HOWE in discussion, as well as the author, discuss the probable future of the elec. steel industry in very optimistic terms.

W. E. RUDER.

**Temperature uniformity in a laboratory electric furnace.** J. B. FERGUSON. *Phys. Rev.* 12, 81-94(1918).—This can best be accomplished by means of 3 independent resistance wire heaters in addition to end plugs. The entire region should be surrounded by a layer of conducting material sufficient to smooth out any local heatings, and the whole furnace should be so insulated that the effect of non-uniformity in the temp. of the furnace surroundings is negligible. Alternate layers of good and poor conductors will reduce the total amt. of insulation necessary. This type of furnace (see fig.) may readily be converted into a simpler type. This furnace yielded





a temp. uniformity of  $\pm 1/2^\circ$  at temps. ranging from 620 to 1190° and at 1000° and 1190° a temp. constancy of  $\pm 1/4^\circ$  for periods exceeding 1 hr. Curves and tables of results are given.

W. E. RUDER.

**Aktie Selakabet Karbidindustri.** ANON. *Farmand* 1918, No. 51, 1139.—The Aktie Selskabet Karbidindustri has been founded recently in Fredrikstad, Norway, with a capital Kr. 1,000,000 and with the purpose of utilizing S. Uthheim's methods of making AcOH and EtOH from  $\text{CaC}_2$ . A plant has been erected for this purpose. From acetylene, acetaldehyde is produced which serves as raw material for manuf. of AcOH, alc., chloroform, artificial rubber, etc. The plant produces 100 kg. acetaldehyde daily but will shortly be extended to a capacity of 3500–4000 kg. daily.  $\text{CaC}_2$  is one of the principal products of Norway's elec. industry and it is produced there at a far lower price than in any other country.

G. HALLBERG.

**Cost of the Muscle Shoals nitrate plant.** BENEDICT CROWELL. *Elec. World* 73, 281(1919).—The estd. cost is \$14,000,000. About 72,000 h. p. continuously will be developed in even the very driest years. The machinery is capable of generating 120,000 h. p.

C. G. F.

**The fixation of atmospheric nitrogen in Germany during the war.** ANON. *J. four électrique* 28, 15–6(1919).—A brief review.

C. G. F.

**Electro-cyanidation of gold and silver ores.** RUSH T. SILL AND HARLEY A. SILL. *Mining and Oil Bull.* 4, 181(1918); *Eng. Mining J.* 106, 988–9(1918).—The old Pelatan and Clerici equipment consisted of a wooden tank with an amalgamated Cu plate on the bottom as cathode, and as anode a rotating cast-Fe shaft carrying 4 arms to keep the pulp in suspension. Mechanical and other difficulties with this app. have been overcome and the process has been made economical and efficient. Compared with standard methods elec. cyanidation has a wider field because it can treat Au and Ag ores in the presence of a larger amt. of base metals, the time of the process is  $1/8$  to  $1/30$  as great, the soln. is in contact with the ore a shorter time, the cyanide is regenerated by the elec. pptn. of the metals, and weaker soln. can be used. A c. d. of 2.75 amp. per sq. ft. (0.29 amp. per sq. dm.) is best. Lime and NaCl are added to the soln. The latter increases the cond. of the soln. and also yields Na, the action of which both aids the amalgamation and increases the protective alkalinity. In a  $2 1/2$ -hr. treatment the pulp travels about 7 mi. over the plate.

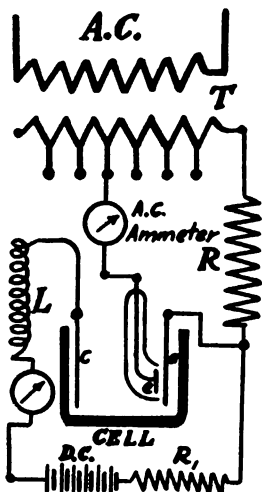
A. BUTTS.

**Electrometallurgical treatment of nickel minerals in New Caledonia.** ANON. *J. four élec.* 24, 3(1919).—Hitherto it has been impossible to obtain ferro-Ni in the elec. furnace low in C and Si. In 1912–1913, garnierite was treated in the elec. furnace during 8 months on a production scale. The charge was mineral, finely powdered wood charcoal, and lime to form a basic slag. Products were ferro-Ni with 50 and 75% Ni, C less than  $1/2\%$ , Si about 0.2%, and with losses of Ni less than 5%. The furnace was of 2-electrode type of 400 kw. capacity. Elec. energy consumed per ton of 50% ferro-Ni was 13000 kw. hr., with electrode consumption of 125 kg. per ton.

C. H. ELDRIDGE.

**Electromotive behavior of oxygen and its anodic production at voltages below the reversible oxygen potential. (Platinum oxides.)** G. GRUBE AND B. DULK. *Z. Elektrochem.* 24, 237–48(1918).—The authors assume that the overvoltage of Pt is due to the formation of Pt oxides which are very unstable and decompose readily into metal and free O. In line with this theory it is assumed that the reaction  $2\text{O} \longrightarrow \text{O}_2$  proceeds very slowly compared to the reactions  $\text{Pt} + x\text{O} = \text{PtO}_x = \text{Pt} + x/2\text{O}_2$ . The e. m. f. of the O electrode was calcd. by Nernst (*Z. Elektrochem.* 11, 835(1905)), Lewis (*J. Am. Chem. Soc.* 28, 158(1906)), and others to be 1.23 volts. The authors believe that their present exptl. results strengthen the assumption that 1.23 is the cor-

rect O potential. As a depolarizing agent, the authors use a superimposed a. c. (cf. Bennewitz, *C. A.* 4, 1708). The auxiliary electrode *c* (see fig.) consisted of a 0.9 cm.



R and  $R_1$  = Rheostats  
L = Choke Coil  
T = Transformer

diam. Pt disk suspended directly opposite the Pt anode (*a*), allowing but a few mm. between the faces of the 2 electrodes. The faces of the anode and of the cathode (*c*) were 13.95 sq. cm. each. The electrolyte was 2 *N*  $H_2SO_4$ , and later *N* NaOH. The normal electrodes used for reference were  $Hg | Hg_2SO_4 | H_2SO_4$  ( $\epsilon_h = 0.676$  volts, 18°) and  $Hg | HgCl | KCl$  ( $\epsilon_h = 0.286$  volts). All measurements were made at room temp., using the Poggendorf-Ostwald compensation method with the capillary electrometer. The a. c. density was varied between 0 and 0.4 amp. per sq. cm. while the d. c. density was maintained const. at 0.0072, 0.0145 or 0.0217 amp. per sq. cm. (the last = 20 amp. per sq. ft.). The superposition of a. c. lowers the d. c. potential very markedly. Not only does the a. c. act as a depolarizer, bringing the O potential down to the normal 1.23 volt, but it depresses the potential below this "reversible" value. O was evolved at the anode at potentials of 1.03 and 1.01 in the case of 2 *N*  $H_2SO_4$  electrolyte. In plotting the values, distinct breaks in the curves are discernible at about 1.50 and 1.15 volts. The lowering of the O potential below 1.6 is attributed to the reducing action of the cathodic component of the a. c. upon the  $PtO_2$  produced by the d. c. electrolysis. The Pt oxide which is active between

2.0 and 1.5 volts is a higher oxide than  $PtO_2$  and between 1.5 and 1.23 volts,  $PtO_2$  is the active oxide. Below 1.23 volts it is probable that the reaction  $H_2O_2 + O = H_2O + O_2$  is the cause of the O evolution, the  $H_2O_2$  being produced primarily by the superimposed a. c.

C. G. F.

**Influence of a magnetic field and of mechanical stirring on the electrochemical cell.** T. MASHIMO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 2, 341-7(1917).—A small cell was used containing Pt wire electrodes immersed in 0.5 *M*  $FeCl_3$  soln., and a small enough d. c. current was sent through the cell so that no gas bubbles appeared. Under influence of a magnetic field, a decrease in potential took place, and the effect increased with strength of magnetic field, but finally approached a limit. When each of 2 Fe wire electrodes is separately influenced by a magnetic field, there is a diminution of potential when a strong field is applied or a strong current is sent through the cell. With a weak field or a weak current through the cell, there is a slight increment in which anode is affected. Mechanical stirring of electrolyte near each electrode separately has the same effect as when a magnetic field is applied to that electrode. With a strong current through the cell the drop in potential is most marked when cathode is affected. With a weak cell current there is an increment in potential when stirring is near the anode that is almost equal to drop in potential when cathode is affected. A mere stirring of electrolyte near one electrode gives rise to an e. m. f. between electrodes of the same metal when immersed in its own or other salt solns. as below:

| Electrode. | Solution.             | Potential at disturbed electrode. | Potential at undisturbed electrode. |
|------------|-----------------------|-----------------------------------|-------------------------------------|
| Fe.....    | 0.5 <i>M</i> $FeCl_3$ | +                                 | —                                   |
| Ni.....    | 1 <i>M</i> $FeCl_3$   | +                                 | —                                   |
| Pt.....    | Dil. HCl              | —                                 | +                                   |
| Cu.....    | Dil. HCl              | —                                 | +                                   |

CHAS. H. ELDRIDGE.

**Carbon brushes.** A. T. BARTLETT, *et al.* *Electrician* 82, 97-8(1919).—Discussion of P. Hunter-Brown's paper (*C. A.* 13, 287). Bartlett attributed copper "picking" of the commutator brushes to electrolysis. In an expt. using Cu graphite brushes with high % of Cu it was found after rotating the commutator for 10 hrs. that the surface of the positive brushes was bright coppery whereas that of the neg. brushes was dead black. M. Kahn had found that the voltage drop between collector and brush was comparatively constant over a large range of current density and showed a minimum value below which no current passed, the conditions resembling those in elec. arcs.

C. G. F.

**Some characteristics of transformer oils.** O. H. ESCHHOLZ. *Elec. J.* 16, 74-6 (1919).—A characteristic of hydrocarbons is the formation, on passage of a disruptive charge at or below the oil surface, of gases radically different from the oil vapor. An app. is illustrated for testing the explosibility of oil and gases, and inflammability of the oil vapors. On passing a heavy discharge between the lower pair of electrodes surrounded by hydrocarbon liquid, large quantities of gas evolved at the terminals rise to the surface and diffuse in the air surrounding the upper pair of electrodes. On passing a weak discharge between the upper terminals, a violent explosion results. A heavy short circuit in a transformer will not cause an explosion while a partial short circuit continuing a considerable period at or below the oil surface means accumulation of large quantities of H and consequent liability of explosion. A proper oil level above the terminal boards prevents arcing between exposed conductors and seepage of water over an insulated lead to the oil surface. The hazard in confined oil is due to arcing adjacent the oil surface. The flash and fire points indicate the hazard of spilled oil exposed to a warm temp. A distinction exists between inflammability of gaseous mixts. due to evapn. of oil and explosibility of a mixt. due to disintegration of oil.

W. H. BOYNTON.

**Testing transformer oils.** A. PHILIP. *Electrician* 82, 103(1919).—Minute quantities of  $H_2O$  were detd. in transformer oils by passing a stream of air through the oil in fine bubbles under a pressure of 20-30" of Hg, at the rate of 2-3 bubbles per sec. The air was thus sucked through the oil and passed through U tubes immersed in a mixt. of ice and HCl. The stream of air was passed for 2 hrs., the U tubes were washed, dried, weighed and the wts. of water calcd. The quantities of  $H_2O$  found were 0.006, 0.014, 0.005, 0.017 and 0.0074 g. per 100 cc. of oil. The latter sample was a transformer oil which withstood a test of 22,000 v. before breaking down. After removal of moisture, this oil withstood 28,000 v. Exposure of the oil for 36 hrs. in close proximity to water and subsequent examn. showed no appreciable absorption of water.

W. H. B.

**Notes on the production of continuous electrical oscillations by the three-valve electrode.** E. V. L. APPLETON. *Electrician* 81, 743(1918).—The 3-electrode thermionic valve when functioning as a generator of continuous elec. oscillations may be regarded as a tube having a negative resistance and its action is analogous to the action of the Poulsen arc or the dynatron.

W. E. RUDER.

**The Cottrell processes of electric precipitation, with especial regard to their application to the recovery of potash as a by-product.** J. S. GRASTY. *Manufacturers Record* 74, 70-2(1918); cf. *C. A.* 13, 61.—G. describes the processes, and gives a list of installations with the purposes of each. He points out the need of dust elimination in blast furnace and Portland cement industries as well as the value of the potash recovered therefrom. The cement industry can furnish 100000 tons of  $K_2O$  per annum and the iron industries even more. Statistics are given.

W. H. BOYNTON.

**Humidity correction factor for pentane lamps.** K. TAKATSU AND M. TANAKA. *Elektro-Techn. Laborat. Dept. of Communications Tokyo*, Oct. 1917, Rept. No. 12,

*Sci. Abs.* 21, 106(1918).—A 10 c. p. Harcourt Pentane Lamp certified by the National Physical Laboratories is compared with a 16 c. p. Ediswan-Fleming C-filament standard lamp. An Assmann ventilated hygrometer was used for humidity measure and the observed c. p. of the pentane lamp was corrected for barometric p. From 162 observations, the value of the humidity correction factor was found to be 0.00638. This agrees better with Paterson and Dudding's value of 0.0063 than with Rosa and Crittenden's value of 0.0057. It is suggested that the hood and ventilating duct used by the latter may play a part in causing the difference between the results of the Bureau of Standards and the National Physical Laboratories as the hood affects the c. p. at the same barometric p. and humidity.

W. E. RUDER.

Electric furnace treatment of refractories (HUTTON) 19. Photometric apparatus (TROTTER) 1.

KEMP, PHILIP: *Alternating Current Electrical Engineering*. New York: The Macmillan Co. 494 pp. \$6.50.

RIDGAL, E. K.: *Electrometallurgy: Electrolytic and Electrothermal Processes*. London: Baillière, Tindall and Cox. 247 pp. 7s. 6d. net. For review see *J. Soc. Chem. Ind.* 37, 481R(1918).

**Electrode for galvanic batteries.** W. O. SNELLING. U. S. 1,288,722, Dec. 24. Electrodes for primary batteries are formed of granular C 49.5, granular  $MnO_2$  49.5 and finely divided metallic Ni 0.5 parts. These electrodes are designed for use with cells of the Leclanché type. The Ni increases the efficiency of the depolarizing action, as do also Ni or Fe oxides, Pt or Pd.

**Electric gravity-battery.** D. H. WILSON. U. S. 1,289,030, Dec. 24. The pat. relates to structural features of a battery with Zn and Cu electrodes.

**Galvanic batteries.** CHLORIDE ELEC. STORAGE CO. and B. HEAP. Brit. 121,188, Dec. 6, 1917. Wood separators are treated in a weak alk. soln., washed in  $H_2O$ , and dried in a vacuum chamber heated by steam otherwise. The alk. soln. may consist of a soln. of NaOH of sp. gr. 1.05, the period of immersion being 24 hrs. or less if the soln. is heated and used under pressure. The separators are made of American cypress or other wood of the same genus, such as California red wood.

**Electrolytic production of magnesium.** G. O. SEWARD. Brit. 120,908, Nov. 11, 1918. A fused electrolyte containing  $MgF_2$  carries a quantity of  $MgO$  in considerable excess of that sol. therein, and is of sufficient d. to prevent rapid subsidence of the undissolved oxide. The sp. gr. should exceed 3, and is preferably about 4. The electrolyte may contain fluorides of metals electropositive to Mg and salts which increase the d. and lower the m. p. A suitable mixt. contains 55 parts  $MgF_2$ , 5 parts NaF, and 40 parts  $BaF_2$ . The temp. of electrolysis may be 900–1000°, and the current d. at the cathode 400 amp. per sq. ft. A suitable cell comprizes a cast-Fe container cooled at the base and encrusted with solid electrolyte, the cathode or cathodes, preferably of cast Fe and with edges or points, projecting through the base. C anodes depend into the electrolyte. Above the cathode is a cooling coil which produces a crust sufficient to shield the floating Mg from the air but easily broken when the metal is to be removed. On the electrolyte floats a layer of  $MgO$  or  $MgCO_3$ , part of the oxide becoming suspended and combining with the F. This layer also protects the anodes.

**Electric furnace for ore reduction.** L. G. ROWAND. U. S. 1,289,056, Dec. 24.

**Electric resistance furnace adapted for reducing zinc ores.** L. G. ROWAND. U. S. 1,289,055, Dec. 24.

## 5. PHOTOGRAPHY.

LOUIS DERR.

**Gum dichromate process with a new colloid.** H. S. STARNES. *Phot. J.* 58, 287-93(1918).—Gum senegal is preferable to gum arabic, being softer, less brittle, and more under control. The sensitizing soln. is 50%  $\text{Na}_2\text{Cr}_2\text{O}_7$ , and the exposure about one-eighth that of printing-out paper; an actinometer must be used. For development the print is soaked 1 min. in water, then flooded in a bath made of 6% HCl in satd. alum soln., dild. to 16 times its bulk. The high lights float away in a few sec., and development is completed with a jet of water from a small nozzle. L. DERR.

**Causes of variation in the Watkins factor for different developers.** J. C. KINGDON. *Phot. J.* 58, 270-80(1918).—The rate of diffusion of different developers was studied by expts. on strips of bromide paper in gelatin jelly. As the blackening progressed there was always at its edge a narrow zone of color, usually red, merging into the advancing black area, and suggesting that the reaction forming it is effected by a developer more dil. than that which effects complete reduction; and from this it appears that a certain concn. of developer is required for complete reduction. With amidol this critical concn. is represented by a normal developer dild. more than 100-fold but probably less than 1000-fold. The increased rapidity of development with rise of temp. is claimed not to be due to increased rapidity of chem. action, but to the faster travel of the zone of critical concn. through the gelatin. From this it follows that the time of appearance of the image will be longer for a developer in which relatively high mol. concn. is needed to effect development. Since the difference in rates of diffusion is not large, the total time required for complete development will be nearly the same for all developers—a familiar fact. Hence the critical concn. is in inverse proportion to the Watkins factors. L. DERR.

**Stripping films.** E. G. *Rev. sci.* 56, 244-5(1918).—The manipulation required to detach a photographic film from its support varies according to the necessity of keeping the original dimensions or of enlarging them. In the first case, the plate may be soaked 15-20 min. in a bath containing 5 g.  $\text{Na}_2\text{CO}_3$  and 20 cc. commercial formalin in 100 cc. water, then dried without washing. The film is then cut through with a knife 2-3 mm. from the edges, and a bath of 10% HCl follows. This liberates fine bubbles of  $\text{CO}_2$  which lift the film from its support. The temporary support, a glass plate carefully cleaned with talc and coated with collodion, is slid under the film, and the plate is dried and coated with 3% collodion contg. a little castor oil. The film when dry is easily detached and is thus protected by the collodion on both faces. To obtain a film of enlarged size, it is enough to omit the formalin from the bath given. A single bath of 10% HCl will usually effect the result, but is uncertain; 10%  $\text{NH}_4\text{F}$  is preferable if a single bath must be used, but the film is then very tenuous. L. D.

**Utilization of old bromide paper.** E. C. *Rev. sci.* 56, 528-9(1918).—If the paper has not been fogged by exposure to light, it should be given a preliminary exposure to diffused light for 1-2 sec., then immersed 5-6 min. in 3%  $\text{K}_2\text{Cr}_2\text{O}_7$  or 8%  $\text{CuSO}_4$ , with a thorough 30-min. wash afterwards. If the paper is very old or fogged, the bath should be 3 g. NaCl and 8 g.  $\text{CuSO}_4$  in 100 cc. water. As these baths increase contrast, they afford a method for converting soft-printing papers into contrast-giving ones. L. D.

**Mechanism of Light-Action on photographic plates; new theory of the development of the latent image.** A. M. CHANOS. *Rev. sci.* 56, 557-8(1918).—Three phases of the action of the developing bath are distinguished: (1) penetration, in which the developer reaches the AgBr grains; (2) reduction, corresponding to the principal reactions which give metallic Ag; (3) precipitation, answering to the appearance of Ag

in grains of visible size, and their growth. The developer dissolves and ionizes the AgBr grains only partly altered by the light, and discharges the Ag ions by the electrons of the soln., thus producing metallic Ag which remains in colloidal soln. The fully exposed AgBr grains act as condensation nuclei, ppt. the colloidal Ag upon themselves, and thus give the black Ag aggregates of the image. These aggregates may attain a vol. which is independent of the exposure the plate has received. L. DERR.

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ANDERSON, PAUL L.: *The Fine Art of Photography*. Philadelphia: J. B. Lippincott Co. \$2.50 net.

BAILEY, HENRY TURNER: *Photography and Fine Art*. Worcester, Mass.: The Davis Press. 124 pp. \$1.50.

CLAUDY, CARL HARRY: *The First Book of Photography, a Primer of Theory and Practice for the Beginner*. New and revized Ed. New York: R. M. McBride & Co. 139 pp.

GIBSON, CHARLES R.: *The Marvels of Photography*. Philadelphia: J. B. Lippincott Co. \$1.50 net.

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**Photographic toning process.** E. R. BULLOCK. U. S. 1,286,890, Dec. 3. Photographic tones of a somewhat reddish color are obtained by treating a Ag sulfide image with a toning bath containing a salt of selenosulfuric acid or of another S-Se acid.

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## 6. INORGANIC CHEMISTRY.

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H. I. SCHLESINGER.

**Action of chlorine on alkali iodides.** W. N. RAE. *J. Chem. Soc.* 113, 880-4 (1918); cf. *C. A.* 9, 3182.—A slow stream of dry  $\text{Cl}_2$  was passed over small amts. of the carefully dried salts contained in weighing bottles until const. wt. was reached. In all cases  $\text{MICl}_4$  appeared to be formed; the increase of wt.-time curves showed no break corresponding to formation of the more stable  $\text{MICl}_3$ . The stability of the compds. proved to be the reverse of their rate of formation. An immediate increase in the rate of formation followed introduction of a trace of water. All the compds. are yellow powders, the color showing a marked gradation with at. wt. of the metal; the Cs compd. is mustard-yellow, that of Li a deep orange. A. R. MIDDLETON.

**Preparation of hypophosphates.** R. G. VANNAME AND W. J. HUFF. *Am. J. Sci.* 46, 587-90(1918).—A modification of the method of Salzer (*Ann.* 211, 1(1882)) is described. Sticks of P about  $3.5 \times 0.65$  in., cast upon glass rods, are suspended in  $\text{Na}_2\text{CO}_3$  soln., 250 g. per liter, so that less than 1 cm. emerges. The rods are adjusted as the exposed P oxidizes and dissolves. When the soln. becomes acid to Congo Red, the rods and holder are transferred to another vessel of fresh soln. The yields are 10-16% of the theory. Neutralization of 250 g. carbonate requires usually 7-10 days; complete oxidation of the sticks of P require 8-9 weeks. A. R. MIDDLETON.

**Carbides of rare earths of the cerium group.** A. DAMIENS. *Ann. chim.* 10, 137-83(1918); cf. *C. A.* 7, 3578, 3932.—This article is a very detailed account of the investigations previously reported together with additional matter. In addition to an extended historical résumé, full details are given of the prepn. and analysis of the carbides and their metallographic investigation, and the analysis of the complex gas mixts. resulting from the action of water upon them. For these methods see *C. A.* 7, 1338, 1468. Some of the data obtained are shown in the following table:

| Carbide                                     | CaCe.                    |             |                                  | CaLa.                    | CaNd.                    | CaPr.                    | CaSa.                    |                          |
|---------------------------------------------|--------------------------|-------------|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Graphite %                                  | 4.0                      |             |                                  | 2.73                     | 2.23                     | 1.61                     | 0.49                     | 2.51                     |
| Reagent.                                    | H <sub>2</sub> O.<br>Cc. | HCl.<br>Cc. | HCl + FeCl <sub>3</sub> .<br>Cc. | H <sub>2</sub> O.<br>Cc. | H <sub>2</sub> O.<br>Cc. | H <sub>2</sub> O.<br>Cc. | H <sub>2</sub> O.<br>Cc. | H <sub>2</sub> O.<br>Cc. |
| Vol. per g.                                 | 121.01                   | 124.6       | 103.2                            | 114.55                   | 102.5                    | 83.5                     | 70.43                    | 104.75                   |
| H <sub>2</sub>                              | 13.4                     | 14.64       | 1.88                             | 10.02                    | 12.61                    | 6.79                     | 5.07                     | 4.82                     |
| C <sub>2</sub> H <sub>2</sub> and homologs. | 68.0                     | 68.56       | 94.38                            | 67.19                    | 67.82                    | 72.16                    | 71.12                    | 72.04                    |
| C <sub>2</sub> H <sub>4</sub> and homologs. | 2.55                     | 1.71        | 0.37                             | 1.98                     | 1.28                     | 1.22                     | 2.32                     | 2.50                     |
| C <sub>2</sub> H <sub>6</sub>               | 5.91                     | 5.62        | 1.82                             | 6.74                     | 7.61                     | 8.18                     | 7.92                     | 9.19                     |
| C <sub>3</sub> H <sub>4</sub>               | 8.87                     | 8.15        | 1.55                             | 12.48                    | 8.41                     | 10.68                    | 12.19                    | 11.45                    |
| C <sub>3</sub> H <sub>6</sub>               | 0.96                     | 1.0         |                                  | 1.36                     | 1.79                     | 0.75                     | 1.28                     |                          |
| C <sub>4</sub> H <sub>10</sub>              | 0.31                     | 0.32        |                                  | 0.23                     | 0.48                     | 0.22                     | 0.10                     |                          |

The speed of decompn. of the carbide increases with the content of graphite; complete decompn. of the CaSa with 0.49% required several days, that with 2.51% only a few minutes. The formation of the hydroxides M(OH)<sub>3</sub> in all cases was rigorously proved. Ce(OH)<sub>3</sub>, which has not previously been described, is white and fixes O in the cold with evolution of heat and formation of Ce(OH)<sub>4</sub>. The O absorbed was always 6-7% greater than the theoretical; this was finally traced to absorption of O by small amts. of liquid unsatd. hydrocarbons retained in the hydroxide. A special app. was devised to permit washing *in vacuo* with EtOH and Et<sub>2</sub>O; the O absorbed was then nearly the theoretical amt. Polished surfaces of the carbides are altered by moisture too quickly to permit microscopical examn. Fragments were imbedded in softened shellac in brass cylinders of 20 mm. diameter so as to leave a portion projecting above the edge of the cylinder. A plane surface was rough ground on emery papers of increasing fineness and polished on felt treated with a pommade of dry vaseline and fine Al powder. The greasy surface remained unaltered for some moments. On a cover glass of the diameter of the cylinder was placed a drop of Canada balsam to which 0.1 its wt. of anhydrous xylene had been added; the greasy surface was quickly rubbed clean on dry felt and fixed in the balsam. Specimens thus prepd. remained unaltered more than a year. The graphitic carbides showed golden yellow polished surfaces. They were homogeneous and perfectly crystd.

A. R. MIDDLETON.

**New complex base of osmium.** L. CHUGAEV. *Bull. soc. chim.* 23, 377-9(1918).

—An aq. soln. of 1 g. Na<sub>2</sub>OsCl<sub>6</sub> and 1.5 g. thiourea acidified with HCl was boiled for some min., filtered while lukewarm, cooled and concd. HCl and solid LiCl in excess were added to increase to the utmost Cl'. A mixt. of two cryst. compds. sepd. differing decidedly in soly. in EtOH. The present paper deals only with the more sol. This was obtained pure by extg. the mixt. with cold 95% EtOH, pptg. by an equal vol. of Et<sub>2</sub>O. The compd. ppts. in sq. tables brownish red with metallic reflection, easily sol. in water forming a fine, intense red soln. Analysis indicated a compn. corresponding to [Os(NH<sub>2</sub>CSNH<sub>2</sub>)<sub>4</sub>]Cl<sub>4</sub>.H<sub>2</sub>O. The water is lost at 125°. Cryoscopic and cond. measurements both indicated 4 ions in aq. soln. A series of red salts is obtained by double decompn., most of which are very sol. in water; much less sol. are the chlorosmate, chlororhodite, chloroiridite, ferro- and ferricyanide. These salts are not described.

A. R. MIDDLETON.

**Hydroxylamine platinum bases.** L. A. CHUGAEV AND I. I. CHERNYAEV. *J. Chem. Soc.* 113, 884-97(1918).—Like NH<sub>3</sub>, NH<sub>2</sub>OH combines with platinum salts to form complex compds. fairly closely analogous to the platinoammines. It can also replace NH<sub>3</sub> to form a series of mixed compds., [Pt(NH<sub>2</sub>OH)<sub>n</sub>(NH<sub>3</sub>)<sub>4-n</sub>]X<sub>2</sub>. Of the six theoretically possible, *vis.*, I, [Pt(NH<sub>2</sub>OH)<sub>4</sub>]X<sub>2</sub>, II, [Pt(NH<sub>2</sub>OH)<sub>3</sub>NH<sub>3</sub>]X<sub>2</sub>, IIIa, *trans*-[Pt(NH<sub>2</sub>OH)<sub>2</sub>(NH<sub>3</sub>)<sub>2</sub>]X<sub>2</sub>, IIIb, *cis*-[Pt(NH<sub>2</sub>OH)<sub>2</sub>(NH<sub>3</sub>)<sub>2</sub>]X<sub>2</sub>, IV, [Pt(NH<sub>2</sub>OH)(NH<sub>3</sub>)<sub>3</sub>]X<sub>2</sub>, V, [Pt(NH<sub>3</sub>)<sub>4</sub>]X<sub>2</sub>, I, IIIa and V have been described. The prepn. and proper-

ties of the remaining three are here described together with the reactions from which their constitution is inferred. *Cis-diamminodihydroxylaminoplatinous chloride*, (IIIa,  $X = Cl$ ), was obtained by heating 1 g. of Peyrone's chloride, *cis*- $[Pt(NH_3)_2Cl_2]Cl_2$  with 0.6 g.  $NH_2OH \cdot HCl$ , 3.5 cc.  $NaOH$  10% soln. and 7 cc. water with frequent shaking to complete soln. On cooling colorless needles sepd. which were recrystd. from dil.  $HCl$ . The salt is readily sol. in water and the  $Cl$  is completely ionized. It forms a very characteristic *chloroplatinite*  $[IIIb]PtCl_4$ , rose-violet needles, sol. in water, which with the chloride of Reiset's Base I,  $[V]Cl_3$ , gave the insol. green Magnus's salt,  $[Pt(NH_3)_4]PtCl_4$ ; also a *chloropalladiite*,  $[IIIb]PdCl_4$ , dirty green, micro-cryst. powder was prepd. The *trans*-isomer was also prepd. in the same manner from the chloride of Reiset's Base II,  $[Pt(NH_3)_2Cl_2]Cl_2$ . The work of Alexander (*Ann.* 246, 239(1893)) was repeated and corrections are noted. A mixed salt (VI) *trans-dichloroamminohydroxylaminoplatinum*,  $[Pt(NH_3)(NH_2OH)Cl_2]$ , was obtained by heating 1 g. of the *cis*-chloride with 25 cc. dil. (1:4)  $HCl$  on the water bath for 1.5 hrs. It forms yellow, dentate crystals, sparingly sol. in cold water, more largely in hot, very sparingly sol. in  $EtOH$ . The  $Cl$  is totally un-ionized upon first soln., but becomes ionic slowly on standing, rapidly on heating. Prolonged action of hot  $HCl$  gives Cossa's acid,  $H[Pt(NH_3)Cl_3]$ , which was identified by pptn. with the chloride of Reiset's Base I, which gave the characteristic orange-yellow scales of Cossa's salt,  $[Pt(NH_3)Cl_3]_2[Pt(NH_3)_4]$ . *Triamminohydroxylaminoplatinous chloride*,  $[IV]Cl_3$ , was obtained by action of anhydrous liquid  $NH_3$  on the mixed salt (VI) in a sealed tube at room temp. as a white cryst. powder; recrystd. from 80%  $EtOH$  in glistening plates, readily sol. in water. Heated with  $HCl$  it gives Cleve's salt,  $[Pt(NH_3)_4]Cl_3$  detected by its characteristic platinochloride. The *chloroplatinite* of  $[IV]$ , obtained by pptg. the chloride with  $K_2PtCl_4$ , is a pale green powder which can be recrystd. from hot water. *Amminotrihydroxylaminoplatinous chloride*,  $[II]Cl_3$ , was prepd. by heating the mixed chloride (VI) with the theoretical quantities of  $NH_2OH \cdot HCl$  and  $NaOH$  in aq. soln. It is very sol. in water but is pptd. by addition of  $EtOH$  or  $HCl$ . Its *chloroplatinite* forms rose-violet needles; the *chloropalladiite*, red-violet needles. *Trans-dichlorodihydroxylaminoplatinum*,  $[Pt(NH_2OH)_2Cl_2]$ , (A), as stated by Alexander, readily obtained by heating  $[Pt(NH_2OH)_4]Cl_3$  with dil.  $HCl$ , was found to form double chlorides with certain chlorides; with the chloride of Reiset's Base I,  $[Pt(NH_3)_4][Pt(NH_2OH)_2Cl_4] \cdot 2H_2O$ , pale yellow prismatic crystals, readily sol. in water; with  $CsCl$ ,  $Cs_2[Pt(NH_2OH)_2Cl_4]$ , having the same appearance and properties. In these compds. an unstable complex anion appears to be formed by union of the non-electrolyte with two  $Cl$  ions. *Trans-dipyridinodihydroxylaminoplatinous chloride* was obtained by dissolving (A) in pyridine; the orange soln. rapidly loses color and a colorless cryst. powder seps. Its *chloroplatinite* forms pale rose prisms. With  $HCl$  the chloride behaves like the corresponding ammino compd. A. R. M.

Action of hydrogen sulfide on mercuric bromide. GIAMBATTISTA FRANCESCHI. Bologna. *Boll. chim. farm.* 57, 221-3(1918).—When several drops of a pure alc. soln. of  $H_2S$  were added to an alc. soln. of  $HgBr_2$  (free from  $Hg_2Br_2$ ) there was at once produced a white turbidity with subsequent pptn. of  $Hg_2Br_2$ . When the alc. soln. of  $H_2S$  was added in greater amt., but not in excess, to an alc. soln. of  $HgBr_2$  there was produced a canary-yellow color with subsequent pptn. of a substance of the same color which proved to have the compn.  $2 HgS \cdot HgBr_2$ ; the formula of the latter may be represented as  $Hg(SHgBr)_2$ . When  $H_2S$  was added in excess a black ppt. of  $HgS$  was produced. The above 3 successive reactions may be represented as follows: (1)  $H_2S + 2HgBr_2 = Hg_2Br_2 + S + 2HBr$ ; (2)  $H_2S + 3Hg_2Br_2 + 3S = 2(2HgS \cdot HgBr_2) + 2HBr$ ; (3)  $H_2S + HgS \cdot HgBr_2 = 2HgS + 2HBr$ . H. S. PAINE.

Influence of some nitrogen derivatives on the conductivity of boric acid (BÖSEKEN, *et al.*) 10. Salts of the complex acid, pyrocatechol-boric acid (BÖSEKEN, *et al.*) 10.



## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAUGH.

The rapid determination of nitric acid. L. MAUGÉ. *l'Industrie chimique* 5, 255-6(1918).—In controlling many commercial processes it is desirable to have a rapid and accurate method for detg.  $\text{HNO}_3$ . In estg. the degree of denitration which sulfonitric mixts. have undergone, satisfactory results have been obtained by a method based on the reaction between  $\text{FeSO}_4$  and  $\text{HNO}_3$ . In concd.  $\text{H}_2\text{SO}_4$  soln.  $\text{FeSO}_4$  gives a brown coloration with small amts. of  $\text{HNO}_3$ ; if more  $\text{HNO}_3$  is added, a point is reached at which the brown coloration is suddenly discharged. This phenomenon appears to be const. When cc.  $\text{FeSO}_4$  mixt. are plotted against %  $\text{HNO}_3$ , a hyperbolic curve results. The brown coloration is produced by the formation of  $2\text{FeSO}_4\text{NO}$ . The final discharge of the color is due to oxidation of the  $\text{Fe}^+$  when the  $\text{HNO}_3$  content is sufficiently great.  $6\text{FeSO}_4 + 3\text{H}_2\text{SO}_4 + 2\text{HNO}_3 \rightarrow 3\text{Fe}_2(\text{SO}_4)_3 + 4\text{H}_2\text{O} + 2\text{NO}$ . Hence, 1 g.  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  is decolorized by 0.075 g.  $\text{HNO}_3$ . A satisfactory standard soln. contains 66.66 g.  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  per l. Into a glass provided with a foot base, measure 10 cc.  $\text{FeSO}_4$  soln., add, with shaking, 50 cc. concd.  $\text{H}_2\text{SO}_4$  (60-66° Bé.). Add from a buret the mixt. to be examined. Shake constantly and add a soln. gradually, at a more or less rapid rate depending on the content of  $\text{HNO}_3$ . The brown coloration may become almost black. Continue the addition until the color is just discharged. To prepare the standard soln., dissolve 67 g. cryst.  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  in 1 l.  $\text{H}_2\text{O}$ ; titrate with  $\text{KMnO}_4$  and calc. the diln. necessary to bring to exact concn. 66.66 g.  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  per l. Stabilize by adding about 10 cc.  $\text{H}_2\text{SO}_4$  to the  $\text{H}_2\text{O}$ . A layer of paraffin oil will partially protect from nitric fumes, but in spite of these precautions the soln. must be prepared fresh from time to time. Graphs assist in making rapid calcns. from the measurements.

H. M. LANCASTER.

Volumetric estimation of the sulfon. R. HOWDEN. *Chem. News* 117, 383(1918).—To the sulfate soln. (e. g.,  $\text{Na}_2\text{SO}_4$ ), add an excess of  $\text{Na}_2\text{CO}_3$  to ppt. Ca or heavy metals and filter; render the filtrate neutral to Me-orange, and add a few drops of phenolphthalein soln. and an excess of pure pptd.  $\text{BaCO}_3$  shaken up with  $\text{H}_2\text{O}$ . Titrate with 0.1 N  $\text{HCl}$  till the red color just vanishes. This requires somewhat more than half the theoretical amt. of acid, and furnishes a fair approximation to the amt. of  $\text{SO}_4$  present. To obtain a more exact result, filter off the insol. Ba salts and wash the filter, and titrate the filtrate, using Me-orange as indicator. (The mixt. may be made up to vol., mixed, filtered, and an aliquot titrated.) The soln. contains both Ba and  $\text{SO}_4$ , but the 2 sources of error are compensatory.

F. W. SMITHER.

A new general method of determining iodine in inorganic and organic compounds. N. TARUGI. *Pisa. Gazz. chim. ital* 48, I, 1-16(1918).—The work described arose out of the necessity of detg. I in aq. solns. of  $\text{ICl}_3$  proposed and used as a sterilizer of  $\text{H}_2\text{O}$  (T. and Bracci, *Igiene moderna* 8, No. 5). The vague instructions found in the literature were of little use in detg.  $\text{ICl}$  and  $\text{ICl}_3$  accurately in aq. solns.  $\text{ICl}_3$  in aq. solns. above 27% in concn. keeps its titer unchanged in colored glass vessels if protected from dust. The dissociation of  $\text{ICl}_3$  into  $\text{ICl} + \text{Cl}_2$  that takes place in the solid state and completely above 25° is very slight in concd. solns. The  $\text{Cl}$  liberated in the 1st phase stops the dissociation and  $\text{HCl}$  that would be formed by hydrolysis also stops the dissociation of  $\text{ICl}_3$ . Freshly prepd.  $\text{ICl}_3$  contains a small excess of  $\text{Cl}$  and this stabilizes the soln. Pure  $\text{ICl}_3$  showed a diminution of active  $\text{Cl}$  and therefore the formation of some  $\text{ICl} + \text{HCl}$ . The soln. then remained unchanged. In concd. solns. the reaction  $5\text{ICl} + 3\text{H}_2\text{O} \rightleftharpoons \text{HIO}_3 + 5\text{HCl} + 4\text{I}$  apparently proceeds backward. In fact the addition of  $\text{HIO}_3$  to a soln. whose titer has become const. produces an increase in the active halogen content. That  $\text{Cl}$  and  $\text{HCl}$  stabilize  $\text{ICl}_3$  soln. is also shown

thus: if a drop of carbonate or  $\text{Na}_2\text{S}_2\text{O}_3$  soln. is added to a concd. soln. of  $\text{ICl}_3$  containing Cl or HCl the fugitive brown of I appears at once, *i. e.*,  $5\text{ICl}_3 + 3\text{H}_2\text{O} \longrightarrow \text{HIO}_3 + 4\text{I} + 5\text{HCl}$  takes place. The  $\text{ICl}_3$  was prepd. as follows: 26.68 g. pure I suspended in 80 cc. distd.  $\text{H}_2\text{O}$  were treated with Cl as long as this was absorbed (24.2 g.) and the whole was dild. to 100 cc. Expts. on the detn. of the 2 halogens separately by reducing with Al (pieces and powder) and extg. the  $\text{I}_2$  formed with  $\text{CHCl}_3$  were not quant. but are fully described. The following reaction was successful:  $6\text{FeSO}_4 + 3\text{H}_2\text{SO}_4 + 2\text{ICl}_3 \longrightarrow 3\text{Fe}_2(\text{SO}_4)_3 + 2\text{I} + 6\text{HCl}$ . The  $\text{FeSO}_4$  soln. was best prepd. by dissolving 14 g. cryst.  $\text{FeSO}_4$  in 100 cc.  $\text{H}_2\text{O}$  and adding 100 cc. 2 N  $\text{H}_2\text{SO}_4$ . This soln. was titrated with  $\text{KMnO}_4$ . A known vol. of the  $\text{ICl}_3$  soln. was placed in a separatory funnel and 25 cc. of the titrated  $\text{FeSO}_4$  soln. added. The mixt. was agitated and allowed to stand 1.5 hrs. The soln. is extd. repeatedly with  $\text{CHCl}_3$  until it becomes colorless. The  $\text{CHCl}_3$  ext. is collected in another separatory funnel and washed with  $\text{H}_2\text{O}$ . The wash  $\text{H}_2\text{O}$  is extd. with fresh  $\text{CHCl}_3$  until colorless. The entire  $\text{CHCl}_3$  ext. is then mixed with an equal vol. of  $\text{H}_2\text{O}$  and titrated for I with  $\text{Na}_2\text{S}_2\text{O}_3$ . The aq. residue from the extn. was filtered and the  $\text{FeSO}_4$  remaining detd. with  $\text{KMnO}_4$ . This gave data from which the Cl could be calcd. Tabulated results on blank expts. with pure  $\text{ICl}_3$  showed perfect data for both the I and Cl detns. In order to det. the amts. of  $\text{ICl}$  and  $\text{ICl}_3$ , resp., present in a mixt. the I and Cl are detd. as stated and from the numerical ratio I:Cl and a table given in the original the amt. of each present is readily detd. A ratio greater than 1.192 indicates that the soln. is  $\text{ICl}_3$  containing excess Cl. A table of densities of  $\text{ICl}_3$  solns. and the %  $\text{ICl}_3$  present by wt. and by vol. is given. The method being so convenient T. has extended it to the detn. of I in other compds. In order to det. I in inorg. compds. the compd. in question is placed in  $\text{H}_2\text{O}$ , cooled in an ice bath and treated with Cl until the presence of excess Cl is evident. The liquid is then dild. to a definite vol. An aliquot portion of the soln. is now taken and treated as above. The  $\text{Na}_2\text{S}_2\text{O}_3$  titration of the  $\text{CHCl}_3$  soln. gives the data sought. With oxygenated compds. an equal wt. of  $\text{NaHSO}_4$  is added to the sample before treating as described above. In the case of  $\text{HIO}_3$  and its salts the detn. with  $\text{FeSO}_4$  can be made directly.  $\text{EtI}$  and  $\text{CHI}_3$  may be converted into  $\text{ICl}_3$  by treating with Cl in  $\text{H}_2\text{O}$  soln. Most org. compds., however, require the following treatment: The compd. is placed in a tubulated retort arranged so that the elongated tube dips into a receiver packed in ice containing 10 cc.  $\text{H}_2\text{O}$ . Five to ten cc.  $\text{H}_2\text{SO}_4$  is introduced with the sample and gradually heated to boiling while a stream of Cl is passed. Care is taken to minimize the contact of Cl and stoppers and connections. This treatment was satisfactory for 11 org. compds. tried. Expts. on the detn. of I in urine when known amts. of KI were dissolved gave satisfactory results. Gravimetric detns. gave the same data as those obtained with this method in urine of patients taking iodides. E. J. WITZEMANN.

**The analysis of aluminium alloys and metallic aluminium.** J. J. FOX, E. W. SKELTON AND F. R. ENNOS. *J. Soc. Chem. Ind.* 37, 328-33T(1918).—In order to combine speed and accuracy in analytical processes for these alloys, the method selected must be specially adapted for the particular type of alloy under examn. For the purpose of analysis three types are distinguished: *Type 1*: Unalloyed Al. The examn. in this case is for all metallic impurities and for Si. Since any single impurity in metallic Al rarely exceeds 1%, the main impurities should be detd. to within  $\pm 0.05\%$ . The detn. of the lesser impurities should be subject to a much smaller error. *Type 2*: Comprizes alloys containing up to 13% Cu and Zn up to 3%. If Sn is present it is usually less than 3%; Mn, Ni, Mg may occur. All these constituents should be detd. to at least within  $\pm 0.1\%$  and generally more accurately. Impurities and constituents such as Fe, Pb and Si should be detd. to at least 0.05%. *Type 3*: Includes alloys containing up to 20% Zn, Cu up to 5% and all other constituents not exceeding 1%.

The Zn in such cases should certainly be detd. within 0.2% and generally within  $\pm 0.1\%$ . A rapid qual. test should be made in order to det. to which of the three classes the metal belongs. Details are given for the detn. of the following: Pb, Mn, Si, Cu, Sn, Fe, Zn, Mg, Ni. Electrolytic methods for Cu, Fe and Zn are special features. Electrolysis of Cu solns. in presence of  $H_2O_2$  gives results which seldom differ by more than  $\pm 0.03\%$  on a 3% Cu content. Using a Au-plated Pt cathode, Fe and Zn are pptd. together. The working details are too numerous and elaborate to admit of satisfactory abstracting.

H. M. LANCASTER.

**Analysis of hard alloys of aluminium.** A. TRAVERS. *Chimie et industrie*. 1, 708-11 (1918).—The alloys referred to are light alloys composed of an Al base with comparatively small amts. of certain other metals which impart interesting mechanical properties. They commonly show 1-5% Cu, 0.3-1% Mg, 2-8% Zn, traces of Fe and Zn amtg. to about 0.5%. Traces of Si may come from the crucibles. In some alloys the Cu is replaced by Ni and Co. The methods given are essentially works laboratory methods, and are remarkably rapid. In 4-5 hrs. an analyst det. Zn, Mg and Fe. A 2nd operator may meanwhile obtain the figures for Cu and Mn in less than 30 min. An attempt to reproduce working details in an abstract would lead to failure, but the following points are noted as special features: A 2 g. portion of the alloy is attacked with a soln. of 15 g. NaOH containing about 20 cc.  $N Na_2CO_3$ . This treatment dissolves Al and Zn, leaving other metals (except Mn) as a residue. The Zn is then sepd. from Al by  $Na_2S$ , the Al remaining in soln. as  $Al(ONa)_3$ . The Zn is finally pptd. as  $ZnNH_4PO_4$  and titrated with 0.2  $N H_2SO_4$  using Me-orange as indicator. The persulfate method for Mn is applied to a special test portion, Al is detd. in the filtrate from the  $ZnS$  containing the Al as  $Al(ONa)_3$ . After removing  $H_2S$  by boiling, apply Stock's method, using a mixt. of KI +  $KIO_3$ . As the light alloys contain only traces of Fe, there is no interference at this point because of Fe. The little Fe present is found in the original insol. residue and can be detd. by means of  $TiCl_3$ . The Mg is first pptd. as  $MgNH_4PO_4$ , using EtOH to complete the sepn. The ppt. is then titrated with standard  $H_2SO_4$ . The detn. of Cu is carried out preferably on a sep. portion of alloy, using the iodide method, if the Cu content is greater than 1%. It is necessary to remove or correct for Fe. If Cu content is less than 1% the colorimetric method is preferred ( $NH_4OH$ , excluding  $NH_4$  salts). The accuracy claimed for this is 0.100%. If Ni is detd. use dimethylglyoxime in presence of tartaric acid. If Co is present and is to be estd. the nitroso- $\beta$ -naphthol method is recommended. H. M. LANCASTER.

**Analysis of ferromanganese.** L. R. TAYLOR. *Chem. Met. Eng.* 20, 53 (1919).—(1) Dissolve 1 g. in 50 cc.  $HNO_3$  (d. 1.13) by boiling gently in a covered beaker for about 30 min.; transfer to a 1. flask, make up to mark and mix, pipet out 25 cc. and det. Mn by the bismuthate method. (2) Treat 0.5 g. of the sample in a casserole with 50 cc.  $HNO_3$  (d. 1.13), evap. to dryness, and ignite over a free flame. Cool, take up with HCl, evap. to dryness, and bake for a few min. at a low temp.; take up with dil. HCl, boil, and filter. Det. Fe in the filtrate by titration with 0.1  $N KMnO_4$ . Ignite the residue, weigh  $SiO_2$ , and calc. to Si (if Si is over 1%, the  $SiO_2$  is treated with HF and  $H_2SO_4$ ). (3) Treat 1.63 g. of the sample as for Fe and Si. After evapp. to dryness with HCl, add just enough HCl to dissolve the residue. Warm, add 20 cc.  $HNO_3$ , and evap. to a sirupy consistency, and repeat this evapn. with  $HNO_3$ . Then add 20 cc.  $HNO_3$ , evap. to about 12 cc., dil. to about 100 cc. with hot  $H_2O$  and cool to 65-75°, filter into a 250-cc. erlenmeyer, and add 60 cc. of filtered  $MoO_3$  soln. Shake for a few min., let stand in a warm place for about 1 hr., filter on a weighed gooch, wash with 3%  $HNO_3$  soln., dry, and weigh (each mg. = 0.001% P). F. W. SMITHER.

**Sampling brass ashes.** H. W. C. *Metal Ind.* 17, 14 (1919).—While the ashes are being loaded into trucks or carts take a shovelful from each barrow, thoroughly

mix the sample and quarter down until from 2 to 10 cwt. (according to size of the lot) result. Grind in a mortar or on a plate, mix and det.  $H_2O$  on a 1-lb. sample. Dry about 7 lbs., weigh out 5 lbs. of the dried material, and crush until every particle except the metallics passes through a 30-mesh sieve; any pieces of Zn, Pb, or Fe are picked out, weighed, and their exact wt. of pure, dry sand is added to the fines. Mix the fines, and make up 3 packets (about 4 oz. each); inside of each place a small packet made up of chippings from the metallics. The 3 packets are sealed in the presence of the buyer's and seller's representatives, and each takes one for assay, the third being reserved for a referee if necessary. The label states the wt., date, amt. of  $H_2O$ , and % of fines and metallics. All mill sweepings and such like residues are burnt to get rid of waste, paper, oil, etc., then riddled through a  $\frac{1}{2}$  in. riddle to remove pieces of brass, Cu and Fe, and the fine material is sampled.

F. W. SMITHER.

**The determination of cadmium by the hydrogen sulfide method.** EDWARD SCHRAMM. *J. Ind. Eng. Chem.* 11, 110-3(1919).—A method is described for the detn. of Cd in brasses when pptd. by  $H_2S$ . S. states in his summary that "because of the mass of salts present, the pptn. with  $H_2S$  must be made in a somewhat larger vol. than the later pptns.; it may sometimes happen, if the concn. of H ion is too small, that some Zn may come down with the 3rd ppt. of CdS. Finally, it must be remembered that CdS is insol. in a soln. containing 2-3%  $H_2SO_4$ , only when the soln. is satd. with  $H_2S$ ."  $NH_4$  salts tend to prevent CdS from entering the colloidal state. ERLE M. BILLINGS.

**The determination of phosphorus in vanadium steels, ferrovanadium, non-vanadium steels, and pig iron.** CHAS. MORRIS JOHNSON. *J. Ind. Eng. Chem.* 11, 113-6(1919).—A series of methods are described for the detn. of P (1) in steel containing V up to 2.6%, (2) in U. S. standard steels and pig irons to which have been added 28% V and in ferrovanadium containing 56.7% V, (3) in non-V steels and pig Fe. In all of these methods an ammoniacal water soln. of  $(NH_4)_2MoO_4$  is used in place of the acid molybdate. Simplicity of prepn., ease of handling, and const. pptg. power are claimed for the soln. To avoid low results sufficient  $HNO_3$  must be present.

ERLE M. BILLINGS.

**Pregl micro-determination of nitrogen.** HANS FISCHER. *Inst. angew. med. Chem. Innsbruck. Ber.* 51, 1322-5(1918).—Wishing to learn if it might not be possible to substitute for Pregl's method (*Die quantitative organische Mikroanalyse*, Springer, 1917) the ordinary Dumas method on a reduced scale, F., like Dubsky (*Vereinfachte quantitative Mikro-Elementaranalyse organischer Substanzen*, Veit, 1917), attempted to do so, using  $NaHCO_3$  as the source of  $CO_2$  and a Cu spiral at the end of the tube. For a long time satisfactory results were obtained until in a systematic study of substances especially difficult to burn the results began to become uncertain; P.'s method was now followed exactly and at once the trouble stopped. There are 2 sources of error in the first method: (1) Even with  $NaHCO_3$  it is not always possible to keep the bubbles of  $CO_2$  as small as is necessary; (2) as pointed out by P., when a Cu spiral is used at the end of the tube instead of CuO and it is heated a non-absorbable gas is given off. A table of the results obtained with 3-7 mg. samples of various compds. by the 2 methods is given. The P. method is also more sensitive than the Lassaing test for the qual. detection of N in small amts.

CHAS. A. ROULLER.

**The detection and determination of nitroso- $\beta$ -naphthol.** PAUL NICOLARDOT AND LUCIEN VALLI-DOUAU. *Bull. soc. chim.* 23, 455-9(1918).—The extn. by  $Et_2O$  of nitroso- $\beta$ -naphthol (a) from its  $H_2O$  soln. and evapn. to dryness of the  $Et_2O$  ext. is inaccurate since the impurities are also sol. A table shows how substances like AcOH increase the soly. of (a) in  $H_2O$ , thereby modifying the titration of the soln. Titration of an EtOH soln. of (a) with  $CuSO_4$  soln., using  $K_4Fe(CN)_6$  as an indicator is accurate only to about 10%. (a) forms 2 metallic complexes:  $(C_6H_4ONO)_2Co$  and  $(C_6H_4-$

$\text{ONO}_2\text{Fe}$ . Use of the former introduces errors of 5% by the simultaneous formation of another complex,  $(\text{C}_{10}\text{H}_8\text{ONO})_2\text{Co}$ . The following volumetric method is described: Dissolve 1 g. of purified (a) in 50 cc. distd.  $\text{Me}_2\text{CO}$ , add 30 cc.  $\text{H}_2\text{O}$  and titrate with a soln. of Fe alum (15 g. in one l.  $\text{H}_2\text{O}$ ), using 20%  $\text{NH}_4\text{CNS}$  as indicator on a spot plate. With this (a) soln. as a standard, weigh 2 g. of the unknown product (dried at  $35^\circ$ ) into a 200-cc. graduated flask containing 120 cc.  $\text{Me}_2\text{CO}$ . Make up to the mark with distd.  $\text{H}_2\text{O}$ , mix, allow impurities to settle, pipet off 100 cc. and titrate with the Fe alum soln. The error is approx. 1%. For more accurate results, add to the sample of (a) an excess of about 10 cc. of the standard Fe alum soln. and about 50 cc.  $\text{H}_2\text{O}$ . Stir, allow the ppt. to settle and filter through a double tared filter. Wash out Fe salts with cold  $\text{H}_2\text{O}$ , dry at  $70^\circ$  to const. wt. as  $(\text{C}_{10}\text{H}_8\text{ONO})_2\text{Fe}$ . The average error with purified (a) is 0.18%. Two different samples of com. product averaged 97.7 and 75.66% (a), resp.

C. H. KIDWELL.

The freezing points of mixtures of phenols, *o*-cresol, *m*-cresol, and *p*-cresol. HARRY MEDFORTH DAWSON AND CHRISTOPHER ARCHIBALD MOUNTFORD. *J. Chem. Soc.* 113, 923-35(1918).—The isomerides mentioned in the title and their homologs possess very close chemical characteristics and also a close degree of approximation in their physical properties. This greatly narrows the opportunity of providing a satisfactory method for detg. the various components. The PhOH and cresols used were purified by distn. and crystn. The former was obtained from com. carbolic crystals while *m*-cresol and *p*-cresol were of synthetic origin. Some *o*-cresol was obtained from purified com. sample and some was of a synthetic origin. To free them of hygroscopic moisture they were distd. at a sufficient rate for 2-3 hrs to distil over 5-10%. The residual liquid was transferred immediately to a well stoppered bottle. Data given represent the results of observations of the lowest temps. at which complete liquefaction occurs. It was frequently necessary to inoculate supercooled mixts. containing *m*- and *p*-cresols to start crystn. "The f.-p. curves for mixts. of PhOH and *o*-cresol appear to consist of 2 branches corresponding to 2 series of mixed crystals. There is no clear evidence of compd. formation. The curve for mixts. of PhOH and *m*-cresol shows clearly the formation of a compd. containing 1 mol. of PhOH in combination with 2 mols. of *m*-cresol. It is likely to be very considerably dissociated in the liquid state. Its m. p. is  $25.9^\circ$  and the eutectic mixts. which are very characteristic of this binary system correspond with 44.8 and 95.2% by wt. of *m*-cresol, the corresponding temp. being  $20.2^\circ$  and  $7.3^\circ$ . The curve system of PhOH and *p*-cresol would seem to indicate the formation of a compd. which crystallizes at low temps. from a limited range of mixts. containing PhOH in excess. Mixts. of *o*- and *m*-cresol seem to form a compd. in which 2 mols. of *o*-cresol and 1 molecule of *m*-cresol are combined. With *o*- and *p*-cresol a compd. is evidently formed containing 1 mol. of *o*-cresol and 2 mols. of *p*-cresol, m. approx.  $8.7^\circ$ . With *p*- and *m*-cresol a compd. is formed containing 2 mols. of *m*-cresol combined with 1 mol. of *p*-cresol. the f. p. of PhOH, produced by the addition of *m*- and *p*-cresol, falls continuously as the proportion of the *p*-isomeride in the mixed cresol increases. When *o*-, *m*- and *p*-cresol in equal proportions are added to PhOH the change in f. p. is slightly greater than that produced by *o*-cresol in the same quantity. The f. p. of *o*-cresol is lowered most by *p*-cresol, slightly less by *m*- and much less by PhOH. The f. p. of *m*-cresol is probably lowered more by *p*- than by *o*-cresol. The f. p. of *p*-cresol is lowered nearly equally by the other three.

ERLE M. BILLINGS.

The estimation of phenol and the three isomeric cresols in mixtures of these substances. HARRY MEDFORTH DAWSON AND CHRISTOPHER ARCHIBALD MOUNTFORD. *J. Chem. Soc.* 113, 935-44(1918).—I. Analysis of mixts. of phenol and *o*-cresol: "Owing to the marked variations in density assigned by different authors to *o*-cresol the f. p.

method would seem to give best results. If the mixt. contains PhOH or *o*-cresol in considerable excess ( $d_{40}^{25} > 1.061$  or  $< 1.050$ ), the compn. may be deduced directly from the f. p. of *X*, the PhOH branch being used for the mixts. of higher density and the *o*-cresol branch for those falling within the lower range. If the density lies between the above limits, *X* should be mixed with a known proportion of standard PhOH (m. 40.5°), so as to raise the density of the resulting mixt. *Y* above 1.061. The f. p. of *Y* is then measured. Assuming that *a* parts of *X* are mixed with 100-*a* pts. of PhOH, and that this mixt., *Y*, contains, according to the f.-p. measurement, *y* % of PhOH, then the % of PhOH in *X* is given by  $x = (y - 100 + a)100/a$ . II. *Analysis of mixts. of m-cresol and p-cresol*: "D. and M. do not find that the nitration method (Raschig) gives a yield of trinitro-*m*-cresol independent of the proportions of *o*-, *m*-, and *p*-cresol in the mixt. Neither do they find that *m*-cresol has a greater Br-absorbing capacity. It is found that the *p*-cresol curve is adapted for use in the estn. of *p*-cresol in mixts. of *m*- and *p*-cresols. The ratio of the mixt. to pure *p*-cresol as 1 is to 2 is most convenient. Knowing the f. p. the % of *p*-cresol may be read from the curve." III. *Analysis of ternary mixts. containing o-cresol, m-cresol and p-cresol*: "The method depends on the fact that equal wts. of *o*-cresol and *m*-cresol depress the f. p. to the same extent, and on the further fact that equal wts. of *m*- and *p*-cresol depress the f. p. of *o*-cresol to nearly the same extent. In the application of the method, the unknown mixt. *X* is mixed with a known quant. of pure *p*-cresol, giving a mixt. *Y*, the f. p. of which is detd. From this the % of *p*-cresol in *Y*, and hence in *X*, can be obtained from the f. p. curve corresponding with the numbers given in the table:

|                         |        |       |       |       |       |       |       |         |
|-------------------------|--------|-------|-------|-------|-------|-------|-------|---------|
| <i>p</i> -Cresol %..... | 100    | 95    | 90    | 85    | 80    | 75    | 70    | 65      |
| Freezing point.....     | 34.15° | 30.7° | 27.2° | 23.6° | 20.0° | 16.3° | 12.3° | 7.8° C. |

Similarly, *X* is mixed with a known proportion of pure *o*-cresol, giving a mixt. *Z*, the f. p. of which is also measured. From this the % of *o*-cresol in *Z*, and hence in *X*, may be derived from the f. ps. recorded:

|                         |        |        |       |       |       |       |       |       |
|-------------------------|--------|--------|-------|-------|-------|-------|-------|-------|
| <i>o</i> -Cresol %..... | 100    | 95     | 90    | 85    | 80    | 75    | 70    | 65    |
| Freezing point.....     | 30.45° | 28.05° | 25.6° | 23.1° | 20.4° | 17.5° | 14.4° | 11.0° |

These temps. correspond with the f. p. curve which lies between the curves representing the changes produced in the f. p. of *o*-cresol on the addition of *m*- and *p*-cresol, resp."

IV. *Analysis of quaternary mixts. containing phenol, o-cresol, m-cresol and p-cresol*: Bromination and nitration processes are of little use with quaternary mixts. "The quaternary mixt. *X* is mixed with about half its wt. of *o*-cresol, following the device recommended by Fox and Barker (C. A. 11, 3199; 12, 2507) in connection with the estn. of PhOH. This mixt., *X'*, is then submitted to slow fractional distn. with a still-head of the Raschig type, and by this means *X'* is sepd. into 2 fractions, 1 of which (*A*) consists of a mixt. of PhOH and *o*-cresol and the other (*B*) of a mixt. of *o*-, *m*- and *p*-cresol. The fractions *A* and *B* are then analyzed by application of the f. p. methods of I and III."

ERLE M. BILLINGS.

Estimation of phenacetin and other *p*-aminophenol derivatives (POWELL) 17.  
Utilization of glycerol residues from Reichert-Wollny estimations (PARKES) 27.

BLISS, A. R., JR.: *A Laboratory Manual of Elemental Qualitative Chemical Analysis for Students of Medicine, Dentistry, Pharmacy and Science*. 2nd Ed. Philadelphia: W. B. Saunders Co. 194 pp. \$2.25 net. For review see *J. Am. Med. Assoc.* 71, 1433(1918); cf. C. A. 9, 1159.

WHITE, EDMUND: *Analytical Reagents: Standards and Tests*. London: Hopkins and Williams, Ltd., 16 Cross St., E. C. 1. 1s. net. For review see *Intern. Sugar J.* 21, 35(1919).

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

**Crystallography of some Canadian minerals; albite, titanite, scapolite, and polycrase.** EUGENE PORTEVIN. *Geol. Survey, Canada. Am. Mineral.* 4, 11-3(1919).—Albite crystals occur at Templeton, Quebec, in cavernous masses of augite, phlogopite, and feldspar, the cavities being lined with fluorite, the secondary albite, calcite and palygorskite, as an alteration product of the augite. Their habit and forms are noted. Titanite from two localities is similarly described. A large crystal of scapolite from Templeton, intergrown with mica and partly incrustured with minute crystals of pyroxene, is described and figured. Polycrase from Cameron, Ontario, is also figured.

E. T. W.

**Contribution to the knowledge of contact metamorphic ore deposits.** TAKHO KATO. *J. Geol. Soc. Tokyo* 24, No. 281, 1-33(1917).—Veinlets of Ca silicate minerals are frequently noted cutting and ramifying through irregularly recrystd. and saccharoidal limestone. This and other evidence indicates that the larger part of the material of these minerals was derived from magmatic emanations. The following general order is observed: deposition of Ca silicates containing little or no Fe; formation of "skarn" minerals, rich in Fe; sulfides and oxides or ore minerals developed contemporaneously with andradite and hedenbergite, or at the closing epoch of deposition; finally veins of chalcopyrite and other sulfides. The skarn formation begins with a pneumatolytic or pneumatolytic-hydrogenetic stage, followed by hydrothermal stages after the solidification of the magma.

S. G. GORDON.

**British iron ore resources.** H. LOUIS. *Nature* 102, 244-5(1918).—A review.

W. H. ROSS.

**The black sand deposits of southern Oregon and northern California.** R. R. HORNOR. *Bureau of Mines, Tech. Paper* 196, 42 pp.(1918).—Black sand deposits in Humboldt and Del Norte counties, Cal., and Josephine, Curry and Coos counties, Ore., were investigated to det. whether any of the deposits were large enough, and contained enough Au, Pt and Fe, for exploitation. The black sands form lenticular deposits interstratified with sands and gravels, and are due to local concn. on beaches by streams which have derived the material from disintegrating basic igneous rocks of the ferromagnesian type. The sands consist of quartz, olivine, garnet, zircon, and other silicates, with magnetite, chromite, ilmenite, hematite, with a little apatite, picotite, rutile, corundum, Au and Pt. The results of the investigation showed that the deposits lack uniformity in occurrence and metallic content, rarely containing enough Au and Pt for exploitation at a profit, while magnetite, chromite, and ilmenite are generally too scattered and too poor to constitute an important source of Fe ore.

S. G. GORDON.

**The barite deposits of Missouri.** WILLIAM A. TARR. *Univ. Missouri Studies* 3, 111 pp.(1918).—The barite deposits occur in a district of dolomitic limestone of Cambrian age, with some shale, chert, sandstone and conglomerate. The barite is usually in crested, divergent groups of tabular, curved crystals. The usual mineral association is barite, quartz, pyrite or marcasite, limonite pseudomorphous after pyrite or marcasite, galena, sphalerite, and sometimes chalcopyrite, calcite, malachite, smithsonite and cerussite. The barite occurs as veins, disseminated deposits, cave deposits, and residual deposits. The veins are not very strong, although apparently very extensive and persistent, occurring in all the formations. Disseminated barite occurs throughout the Potosi, and to a certain extent in the Proctor, formations, either filling numerous small cavities in the rock, or replacing it. Disseminated barite is much more

abundant near the larger veins, and is probably genetically connected with them. Barite further fills the openings between large blocks of dolomite and in soln. cavities. Crystals in these cave deposits weigh several lbs. each and occur in clusters weighing 200 to 300 lbs. The barite is deposited on the bottoms of the cavities, and veins dipping 60° or more may occur along the sides of the cave. The order of deposition in the caves is the same as in the veins: quartz, pyrite, galena, sphalerite, barite. The residual deposits form the most important economic type, masses of 1000 lbs. occurring in these surface deposits. The barite occurs as loose fragments scattered through a deep red clay, more or less mingled with drusy quartz and chert, or as large masses in disaggregated dolomite at the bottom of the clay, in the Central district being confined to the clay immediately above the dolomite. The residual deposits are due to the concn. of the barite of the other types of deposits by the soln. of the dolomite in weathering. The origin of the barite in the underlying rocks is discussed in detail. It is regarded as improbable that the barite was concd. from the surrounding sedimentary rocks by meteoric waters. It is further pointed out that the mineral association is similar to veins of igneous origin, that the igneous rocks afford an adequate source of Ba, and that the ability of rising heated solns. to transport Ba is greater than that of descending solns. Analyses of the Elvins, Potosi, Proctor, and Gasconade dolomites are given. The major part of the barite is found at an average depth of 4 to 5 feet, holes 10 or 12 feet being rare, although 20 feet has been attained. The mining methods, preparation, and treatment of the barite are described, and 39 uses listed.

S. G. GORDON.

**Further work on the igneous rocks associated with the Carboniferous limestone of the Bristol District.** SIDNEY H. REYNOLDS. *Quart. J. Geol. Soc.* 72, 23-42(1917).—Olivine-bearing rocks including olivine-basalts and olivine-orthoclase-basalts occur in the Carboniferous limestones of the Bristol District. The field relations and petrography, with analyses, are described.

S. G. GORDON.

**The Lurgecombe Mill lamprophyre and its inclusions.** HERBERT G. SMITH. *Quart. J. Geol. Soc.* 72, 77-83(1917).—A petrographic description with an analysis. Inclusions of magnetite, corundum, staurolite and spinel are described, their origin being believed due to fragments of the country rock picked up by the magma in its intrusion.

S. G. GORDON.

**The picrite-teschenite sill of Lugar (Ayrshire).** GEORGE W. TYRRELL. *Quart. J. Geol. Soc.* 72, 84-131(1917).—The rock types described include teschenite, theralite, lugarite, picrite, and peridotite, which form a composite sill. Their field relations, contact phenomena, mineralogic and chem. compn., with a number of analyses, mode of intrusion and differentiation, are described in detail.

S. G. GORDON.

**The pseudotachylite of Parijs (Orange free state) and its relation to "trap-shotten gneiss" and "flinty crush-rock."** S. JAMES SHAND. *Quart. J. Geol. Soc.* 72, 198-221(1917).—The rock occurs as dense black glass veins in granite. The occurrence, petrography, origin and compn. are discussed, and 3 analyses given.

S. G. GORDON.

**The Tertiary volcanic rocks of the district of Mozambique.** ARTHUR HOLMES. *Quart. J. Geol. Soc.* 72, 222-79(1917).—A detailed petrographic description of the volcanic rocks of the district, which include solvsbergite, aegirine-trachyte, trachytoid-phonolite, tephritic pumice, basalt, picrite-basalt, hornblende andesite and pyroxene andesite; includes analyses and a discussion of distribution, period and order of eruption, relationships and origin, and radioactivity.

S. G. GORDON.

**Geology of the coast region of Cheh-Kiang-Sheng.** SEIJIRO NODA. *J. Geol. Soc. Tokyo* 23, No. 268, 14-6(1916).—The topography and geology are briefly noted, and an analysis is given of a K-Na granite.

S. G. GORDON.



**The volcanoes of Japan.** BUNDJIRO KOTO. *J. Geol. Soc. Tokyo* 23, No. 268, 1-13; No. 269, 17-28; No. 270, 29-55; No. 272, 77-94; No. 273, 95-127(1916).—There occur in Japan 170 post-Tertiary and 55 active volcanoes. Their geologic history, distribution, and rock types are reviewed, with analyses of pitchstone from Horai-san and Fukugawa; dacitic (?) obsidian, Hime-shima; rhyodacite and mica-andesite, Sanuki; hornblende andesite, Tsuru-shima and Hime-shima; bronzite andesite, Takahama; and orthobasalt, loc. uncertain. S. G. GORDON.

**The characteristics of the eruption of Sakura-Jima in 1914.** BUNDJIRO KOTO. *J. Geol. Soc. Tokyo* 23, No. 278, 181-204; No. 279, 205-26(1916); 24, No. 280, 1-17 (1917).—The phenomena are discussed under the following headings: predisposing causes, premonitory symptoms, phases of eruptions, mass and dimensions of the lava, temp. of lava, the lapilla, ash and sand (with 2 analyses of ash), the subsidence of the Sakura-jima environs, the ventholes, the spatter eruptions and the formation of domes, and the sublimation products: S, gypsum, sal ammoniac, molysite or erythrosiderite, kremersite, kalinite, halite, chloraluminite, and Fe alum. S. G. GORDON.

**Geological observations in Fiji.** WILBUR GARLAND FOYE. *Proc. Am. Acad. Arts Sci.* 54, 1-145(1918).—This paper comprizes a description of the geology and petrography of the Fiji Islands, with special reference to coral reefs. Analyses are given of soapstone, Fiji and Suva; limestone, Lambasa; tonalite, Vunatoto; olivine basalt, Lautoka; basalt, Nathula; gabbro, Lambasa; andesitic basalt, Tota; olivine basalt, Yanu Yanu; andesitic basalt, Thikombia-i-lau; olivine basalt, Ono Levu; olivine basalt, Kambara; and hornblende andesite, Kandavu. S. G. GORDON.

**The sequence of lavas at the north head, Otago Harbor, Dunedin (New Zealand).** PATRICK MARSHALL. *Quart. J. Geol. Soc.* 70, 382-408(1915).—The succession, petrography, compn., and origin of the different rock types are described. Analyses are given of each of the 25 flows, which include trachyte, phonolite, kaivekite, basalt, and trachydolerite, all of which flowed down the same slope, probably having issued from the same volcanic orifice. S. G. GORDON.

**The constitution of the earth's interior.** R. D. OLDHAM. *Nature* 102, 235-6 (1918).—A synopsis of a discussion at a meeting of the British Geophysical Committee. W. H. ROSS.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

**Slime treatment on Cornish frames, with particular reference to the effect of surface.** S. J. TRUSCOTT. *Bull. Inst. Mining Met.* 171, 1-4(1918).—Discussion by W. H. Trewartha-James of a paper by T. (cf. C. A. 12, 465, 1036). The author has plotted a curve showing the loss of "Sn" in the process of enrichment. The curve is entirely opposed to Truscott's theory that the last portion of the gang is the most difficult to remove. The following conclusions are drawn from the tests by Truscott: (1) That surface *per se* has no inherent effect in concn. work. (2) That the efficiency of concn. operations depends almost entirely on the inclination of the frame in relation to the pulp consistency (or dila.), for a pulp of a given classification.

F. W. SMITHER.

**The development of galena flotation at the Central mine, Broken Hill.** R. J. HARVEY. *Bull. Inst. Mining Met.* 171, 3-13(1918).—Discussion by H. K. Picard *et al.* of a paper by H. (cf. C. A. 13, 302.) F. W. SMITHER.

**Concentration of lead-zinc-silver ore at the Zinc Corporation's mine.** G. C. KLUG. *Mining Sci. Press* 118, 89-92(1919).—A description with flow sheet of the prac-

tice of an Australian plant. The treatment aims at sepg. the ore into the following products: (1) Pb concentrate assaying 66% Pb, by jigging and tabling. (2) The elimination of as much of the calcitic gang as possible in the form of a sand, which assays 5% Zn, 1.6% Pb, and 0.6 oz. Ag, and which is used for filling underground. (3) Collection of all the slime for preferential flotation treatment (Lyster and Seale-Shellshear methods) in the slime unit. (4) The balance forms a Zn middling, which is treated at the Zn concentrator.

F. W. SMITHER.

**The production of the precious metals during the year 1917.** Annual report of the Director of the U. S. Mint for the year ended June 30, 1918. Pp. 259.

E. J. C.

**Gold, silver, copper and lead in South Dakota and Wyoming in 1917.** CHARLES W. HENDERSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 153-65 (preprint No. 11, published Jan. 27, 1919); cf. C. A. 12, 128.

E. H.

**Refining gold bullion with chlorine gas and air.** R. R. KAHAN. *Bull. Inst. Mining Met.* 171, 15-6(1918).—Discussion by T. K. Rose of a paper by K. Cf. C. A. 13, 303.

F. W. SMITHER.

**The application of charcoal to the precipitation of gold from its solution in cyanide.** H. R. EDMANDS. *Bull. Inst. Mining Met.* 171, 5-15(1918); cf. C. A. 12, 1453, 1539.—Discussion by A. W. Allen, who claims that the exptl. work of E. and others proves that the pptn. of Au or a Au compd. by charcoal is an adsorption phenomenon and is not due to occluded CO in the pores of the charcoal.

F. W. SMITHER.

**Tinplate manufacture and detinning.** ANON. *Engineering* 106, 701-2(1918).—A review based on a paper by Bailey (cf. C. A. 12, 1453). The detinning processes are discussed, with a description of the Goldschmidt process.

F. W. SMITHER.

**Widening demand for blast furnace slag.** C. A. WRIGHT. *Iron Age* 103, 241-3 (1919).—An illustrated review and discussion of American activities. Among the uses developed are: a concrete aggregate for reinforced concrete buildings, foundations for buildings and heavy machinery; floors, roofs, retaining walls, bridges, culverts; paving, sidewalks, curbs, and gutters; dams, reservoirs; cement blocks, bricks, lintels and fence posts; cushions under brick and block pavements, top dressing and surfacing rough roads; filter material for chem. processes and sewage disposal plants; filler for commercial fertilizer; railroad roadbeds. It is estd. that approx. 20,000,000 tons of slag were produced last year by the blast furnaces in the U. S.

F. W. SMITHER.

**The inflammability of aluminium dust.** A. LEIGHTON. *Bur. Mines, Tech. Paper* 152, 15 pp.(1918).—The author reviews the literature, discusses the properties affecting explosibility, and describes the exptl. procedure followed (Clement-Frazer app.). *Conclusions:* "Although the expts. do not show the exact conditions under which an ignition of the Al dust is obtained, they do show that it may ignite at temps. even lower than those necessary for the ignition of 200-mesh standard Pittsburgh coal dust; also more heat is needed to ignite Al dust. The dust used was a commercial "Al bonze." *Precautions:* Use a ventilating system that will not raise loose dust into suspension nor keep it in circulation. Use a system supplying dry air at a fairly even temp. and see that the vol. of air supplied is enough to remove quickly any H from the room. Have machinery well grounded, well cared for, and properly oiled. Use tools of soft metal as far as practicable. Have machinery inclosed as far as possible. Use vacuum dust-collecting devices over machinery likely to spread dust. Use no naked lights. Isolate dangerous processes in sep. buildings. Avoid wood construction as far as possible. Avoid use of liquids in putting out fires, except, perhaps, oil, with subsequent use of CCl<sub>4</sub>. Use sand or preferably shale dust for fire extinction (the use of Na<sub>2</sub>CO<sub>3</sub> for this purpose should be investigated)."

F. W. SMITHER.

**Report of Committee A-1 on steel.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. 1, 100-41(1918).—Slight changes were adopted in the specifications for forgings, car axles, welded steel and wrought-Fe pipe, boiler and firebox steel and for structural steel used in car manuf. E. E. R.

**Report of Committee A-2 on wrought iron.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 142-5(1918).—Changes are proposed in the specifications for boiler tubes, staybolt iron, engine-bolt iron, refined bars, iron plate and iron and steel chain. E. E. R.

**Report of Committee A-3 on cast iron.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 156-7(1918).—A hardness test is introduced and the behavior of cast iron when acted upon by superheated steam has been studied. E. E. R.

**Report of Committee A-5 on corrosion of iron and steel.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 158-242(1918).—Extensive corrosion tests were started at Pittsburgh, Pa., and at Annapolis, Md., in Dec., 1916, and at Fort Sheridan, Ill., in 1917. The various exposed sheets of metal have been inspected in April and October of each year. The exposure of the sheets at Fort Sheridan and at Annapolis has been too short to develop failure in any of the sheets but at Pittsburgh some failures are reported. The chem. compn. of each of the 715 sheets is given. The detailed reports of the inspectors are tabulated and photographs shown of all sheets that had failed up to April, 1918. In Appendix III of this report the chairman of the committee, HENRY S. RAWDON, describes the *microstructure of 4 types of Zn coatings on Fe and steel* and compares them with the coating obtained when Fe is held for a relatively long period in contact with molten Zn such that conditions approaching equil. are obtained. Hot-dipped and sherardized coatings are shown to be fairly complex in structure and considerable alloying with the Fe takes place. The sprayed and electrolytically deposited coatings have a more simple structure. The alloy layers stand in the same general relation to Fe in their electrolytic solution tension as does Zn itself though not to the same degree; hence they do not accelerate the corrosion of the Fe base though they may cause the outer Zn to disappear at a more rapid rate than if they were not present. The mechanical properties of the hot-dipped coatings are influenced considerably by the degree to which the alloy layers are developed. This appears to depend more upon the time of keeping the sheets in the bath than upon the mere thickness of the coating. The uniformity of thickness in the coatings obtained by spraying or electrolytically together with the av. thickness appear to be the principal factors detg. the efficiency of such coatings. Great variations in thickness of electrolytic deposits were found even on flat surfaces. In Appendix IV, the method of making the salt-spray corrosion test is described. E. E. R.

**Report of Committee A-6 on magnetic properties.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 243-5(1918). E. E. R.

**Report of Committee B-2 on non-ferrous metals and alloys.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 246-9(1918). E. E. R.

**Report of Committee E-1 on methods of testing.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 399-421.—Appendix II of this report contains a valuable discussion of tension tests of steel with specimens of various size and form. E. E. R.

**Report of Committee E-4 on magnification scales for micrographs.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 425-7(1919). E. E. R.

**Grain size of iron as affected by temperature.** D. J. McADAM, JR. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 68-86(1918).—The effect of temp. on the grain size of ingot Fe was detd., with other factors, such as strain gradient and temp. gradient, eliminated as much as possible. Curves and tables are given showing the effect of

temp. and time of annealing on the size of the grains. As in a previous paper (*Ibid* 17, Pt. II, 58(1917)), M. concludes that below 785° the coalescence tendency of recrystd. grains is slight. Above 785°, the coalescence tendency grows with increasing rapidity; it reaches a max. at about 870°.

S. G. SIMPSON.

**Changes within the critical range of a given steel: from  $Ac_1$  to  $Ac_{3-2}$ .** J. G. AYERS, JR. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 87-97(1918).—One end of a strip of 0.50% C steel was heated well above its crit. range, the entire specimen was quenched in  $H_2O$ , the surface carefully ground off, and photomicrographs were taken all along the specimen. Reproductions of these at representative points are given and the structure shown in each case is briefly described.

S. G. SIMPSON.

**Season cracking and splitting of condenser tubes and pipes.** WILLIAM CAMPBELL. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 147-52(1918).—Several samples of split brass condenser tubes were examd. Twelve samples from the sound portions of the tubes were immersed in  $HgNO_3$  soln. Only one sample showed internal strain by splitting open. It is concluded that either the longitudinal cracks in the remaining condenser tubes were not due to internal strains revealed by the test or else the strains were localized and were relieved by the splitting. The article is accompanied by several photomicrographs showing the various types of structures examd.

S. G. SIMPSON.

**The causes and prevention of corrosion cracking.** W. H. BASSETT. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 153-62(1918).—Season cracking and fire cracking occur in Cu-Zn alloys only when they contain less than 80% Cu. Cu-Zn-Ni alloys are subject to cracking, but pure Cu-Ni alloys are not. Cu-Sn and Cu-Al alloys when made hard by cold deformation are sensitive to cracking only when low in Cu. With wrought brasses in the  $\alpha$ -phase, the cracks pass between the crystals; in the  $\beta$ -phase the cracks pass across the crystals, and in both  $\alpha$ - and  $\beta$ -phases, the cracks pass through the  $\beta$ . Both internal strain and corrosion are always factors in the cracking of brasses, and atmospheric conditions greatly influence the rate of failing. The presence of Pb, Sn, Fe, etc., apparently has little effect except by increasing resistance to corrosion, although expts. with brasses containing varying amts. of Cd showed that Cd increases the ductility of brass and thereby decreases its liability to crack on account of internal strains. Cracking is prevented by frequent polishing, by annealing, and by regulating the deformation so as to diminish strains.

S. G. SIMPSON.

**Season cracking.** W. RUBEN WEBSTER. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 163-4(1918).—A brief discussion of the phenomenon of season cracking of brass. W. claims the common test for internal strain with  $HgNO_3$  to be too severe and not one to be given general application.

S. G. SIMPSON.

**Initial stress and corrosion cracking.** P. D. MERICA AND R. W. WOODWARD. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 165-78(1918).—Initial stress in a brass is due to the fact that the heating, rolling or working of the brass is not applied uniformly. It may also occur in a material which is not uniform in compn.; thus, when 60-40 brass consisting of the  $\alpha$ - and  $\beta$ -solid soln. is suddenly cooled, the difference in the coeff. of expansion of the 2 phases leaves the  $\alpha$ -particles in tension. Such stresses may amount to 16,000 lbs. per sq. in. Several methods of measuring initial stress are reviewed, and it is concluded that the Hg salt soln. test is a necessary one in the testing and inspection of brasses. 60-40 brasses subject to corrosion cracking only when the surface layers are under an initial stress greater than 25,000 lbs. per sq. in., but M. and W. suggest that a limit of 15,000 lbs. be required. With 60-40 brasses which are to be subjected to tensile stress in service, the sum of the surface layer initial stress and the externally applied stress should not exceed this limit. Initial stress may be sufficiently

eliminated by annealing at 200° or by a mechanical process which introduces a stress at the surface of opposite sign to that already present—the latter method being the more promising for production purposes.

S. G. SIMPSON.

**The prevention of season and corrosion cracking of brass artillery cases by special heat treatment.** W. B. PRICE. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 179-88 (1918).—Sixteen samples of 75 mm. brass cases not heat-treated were subjected to the Government test of immersion for 4 hrs. in a 1.5% soln. of  $\text{HgCl}_2$ . Five of them developed cracks. A number of cases from the same lots was then heated for periods of 1, 2 and 3 hrs. at 500° F. Not one of these failed in the  $\text{HgCl}_2$  test, thereby showing marked diminution in the degree of internal strain. It is also certain that the heat treatment left the cases in a condition to resist corrosion or season cracking on the ballistic test and on long standing; and it is probable that the heat treatment increased the tensile strength several thousand lbs. per sq. in. Photomicrographs show that the heat treatment did not affect the structure except for slight local recrystns. in those cases subjected to the longer heat treatments.

S. G. SIMPSON.

**The use of mercury solutions for predicting season cracking in brass.** HENRY S. RAWDON. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 189-200(1918).—Solns. of the  $\text{Hg}^{\text{I}}$  series of salts are considerably more active than solns. of the  $\text{Hg}^{\text{II}}$  series in promoting the cracking of highly stressed brass of the 60-40 type. In the rods used, the action of the  $\text{Hg}^{\text{I}}$  soln. was, in general, localized in producing one deep crack; the  $\text{Hg}^{\text{II}}$  solns. caused the specimen to crack in several places. The size of the specimen was found to be negligible with material in which the stresses producing the cracks lie in the plane of the cuts made in sampling the piece. In other types of material, the size of the piece must be given consideration. The character of the surface is a factor of considerable importance in detg. the immersion period required to produce cracking. Simple polishing of the surface was sufficient to increase this period in the ratio of 1:6 or 7. Specimens which are required to stand a specified period of immersion should be examd. after they have stood for some time after being removed from the soln. as well as when first removed. The Hg dissolved especially by the  $\beta$  constituent reduces the cohesion between adjacent crystals sufficiently so that intercryst. type of fracture results.

S. G. SIMPSON.

**A simple type of Brinell testing machine for 500 kg. load.** A. V. DE FOREST. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 449-59(1918).—A simple and inexpensive type of Brinell machine for 500 kg. load is described. A series of measurements with 5 diff. machines shows the errors involved in the test on annealed brass, and the simple type of machine is proved to be satisfactory. The hardness of annealed brass in the finished sheet sometimes varies by 2 or 3 Brinell hardness nos. in as many inches. This is shown not to be an error in the machine. It is therefore desirable to make several indentations in each sample. As individual Brinell machines may have considerable systematic error, it is suggested that some standard method of calibration be devised. A method is described by which 2 samples may be tested at once with the machine by placing the Brinell ball in a flexible holder between the 2 specimens. Other suggestions are made as to the possibility of obtaining speed and accuracy with this method of hardness detn.

S. G. SIMPSON.

**A new method of obtaining Brinell hardness.** J. G. AYERS, JR. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 460-77(1918).—Instead of using a dead load hydraulically applied as in the general type of Brinell machine, a definite impact was employed. This impact was obtained by fastening the Brinell ball to the bottom of a given weight and allowing it to drop from a given height upon the test specimen. From the diam. of the impression thus produced, the true Brinell hardness no. may be obtained from a conversion table. The machine is stated to be simple in construction, rapid in action,

and sufficiently accurate for most commercial testing. The discussion following the article brings out the fact that A.'s method is not new, and that it has been found that the harder the metal is, the greater the difference between the hardness nos. detd. by using a gradually applied static load and those detd. by impact. S. G. S

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PEERLESS DRAWN STEEL CO.: **Cold Drawn Steel Bar Weights of Rounds, Flats, Hexagons and Squares, Weight Tables for Plates, Metric Conversion Tables, Cold Drawn and Hot Rolled Extras and other Miscellaneous Tables**. 2nd Ed. New York: Peerless Drawn Steel Co. 153 pp.

TAYLOR, F. W.: **La taille des métaux**. Translated into French by L. Descroix. Paris: H. Dunod et E. Pinat. 296 pp. 16 francs. For review see *Rev. sci.* 56, 126 (1918).

**Smelting ores**. J. A. YEADON and T. WHITAKER. *Brit.* 120,610, Nov. 12, 1917. A portion of the fuel required for smelting Fe, Cu, or other ores is supplied in finely divided form to the bottom of the furnace through the blast pipes by means of feeding app. of the kind described in 114,971 (*C. A.* 12, 1831).

**Distilling zinc**. E. S. BERGLUND. *Brit.* 120,549, July 26, 1918. See *Can.* 187,455 (*C. A.* 13, 95).

**Iron; furnaces**. P. F. CHARLES, E. F. BRODERICK and E. A. KIRBY. *Brit.* 120,400, Sep. 6, 1916. For making wrought Fe, pig Fe is initially melted, fluxed and boiled in a rotary furnace without manual labor, up to the point of graining the Fe, and the boiling furnace is then moved bodily and tilted so as to transfer the charge to a

stationary balling or puddling furnace in which the metal is further treated and formed into balls by manual labor. Two rotary boiling furnaces are arranged one on either side of a puddling furnace and are adapted to be swung bodily on cranes over the latter and tilted to discharge their contents into it, one after the other, when the door below a charging hopper is opened. The puddling furnace has a vertically sliding door at each side or end, with a puddling or balling opening therein. The rotary boiling furnaces are constructed with a fixed fire chamber and a fixed chimney flue with a charging door. The rotary body rests on rollers and is operated by a rack and pinion. It may be disengaged from the fixed portions to enable it to be lifted and swung by the cranes.

**Malleableizing cast iron.** F. PERRY and INDUSTRIAL INVENTIONS, LTD. Brit. 121,074, Apr. 26, 1918. Fe castings to be malleableized are heated in the presence of Mond, blast-furnace, or like gas contg.  $\text{CO}_2$  and H. Sufficient CO is preferably present to prevent excessive decompn. of the  $\text{CO}_2$  by the H. S and hydrocarbons are preferably removed from the gas before use. The temp. of treatment is  $700\text{--}800^\circ$  for black-heart castings, and  $800\text{--}950^\circ$  for white-heart castings.

**Open-hearth steel.** H. C. RYDING and A. W. ALLEN. U. S. 1,289,057, Dec. 24. Open-hearth steel from all-blown metal is made according to the following procedure: The furnace is first charged with lime and Fe oxide and then with low-C molten blown metal and the materials are heated until the bath and slag are in proper condition, after which high-C blown metal is added and the charge is poured after the finishing operation. As a second operation, the open-hearth furnace is charged first with low-C molten blown metal and then with lime and  $\text{Fe}_2\text{O}_3$ , followed by heating and addition of high-C molten blown metal before finishing and pouring the charge. The first operation serves to build up the furnace bottom and the second to erode it, the 2 procedures in alternation thus serving to maintain the furnace in substantially uniform condition.

**Casting metals.** E. HAMELIUS. Brit. 120,706, July 6, 1918. In order to give greater cohesion and less porosity to cores made of white sand, about 4% of litharge is added to the linseed oil to form the agglomerating material.

**Alloys.** COOPER CO. Brit. 120,565, Oct. 15, 1918. Alloys consisting of Al and Be, the proportion of Be being from 1 to 99% of the whole. The alloys may be prepd. by melting the metals together or by electrolyzing a soln. of the mixed oxides.

**Alloys; torpedoes.** STABILIMENTI BIAK-ING. A. POUCHAIN. Brit. 120,557, Oct. 8, 1918. Making parts of torpedoes, especially guns in the nose thereof, for destroying defense nets, of high resistance alloys of Al with Fe, Ni, Zn, Cu and Mn, *e. g.*, an alloy containing 2% Mn, 1% Fe, and the rest Al; or 5% Cu and the rest Al; or 10% Zn and the rest Al.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

**Bromination of some derivatives of veratrole.** JOHN L. SIMONSEN AND MADYAR GOPALA RAU. Presidency Coll., Madras. *J. Chem. Soc.* 113, 782-90(1918).—The bromination of 2,3-MeO(AcHN) $\text{C}_6\text{H}_3\text{OMe}$ (A) in  $\text{CHCl}_3$  with a cold  $\text{Br-CHCl}_3$  soln., followed by treatment with  $\text{H}_2\text{O}$ , gave rise to 6-bromo-3-acetylaminoveratrole (B), 2,3,6-MeO(AcHN) $\text{BrC}_6\text{H}_3\text{OMe}$ , prismatic needles from aq. AcOH, m.  $78^\circ$ . When treated with HCl at about  $100^\circ$ , (B) was converted into 6-bromo-3-aminoveratrole (C), needles from dil. MeOH, m.  $66^\circ$ . The benzoyl derivative (C), needles from dil. EtOH, m.  $75^\circ$ . 3-Bromoveratrole (D), 2,3-(MeO) $\text{BrC}_6\text{H}_3\text{OMe}$ , b.  $114^\circ$ , was formed by the diazotization of 2,3-MeO( $\text{H}_2\text{N}$ ) $\text{C}_6\text{H}_3\text{OMe}$ , followed by treatment with  $\text{Cu}_2\text{Br}_2$ . (D) was converted

into 2,4,6-MeO(O<sub>2</sub>N)BrC<sub>6</sub>H<sub>2</sub>OMe, m. 112–3° (cf. Jones and Robinson, *J. Chem. Soc.* 111, 903(1917)), when treated with HNO<sub>3</sub> (d. 1.4) in AcOH. (D) was also formed when (C) was treated with AmNO<sub>2</sub> in EtOH. When 5 g. (A) in 20 cc. cold 50% AcOH was gradually treated with 4.2 g. Br, the mixt. dild. with H<sub>2</sub>O, and the soln. neutralized with NH<sub>4</sub>OH, a mixt. of 5.5 g. (B) and 2 g. 4- or 5-bromo-3-acetaminoveratrole (E), octahedra from Me<sub>2</sub>CO, m. 151°, was obtained. (E) was sepd. from (B) by means of its lower soly. in Me<sub>2</sub>CO. The corresponding free amine (F), needles from aq. MeOH, m. 49°. The benzoyl derivative of (F), needles, m. 146°; chloroplatinate of (F) forms yellowish brown prisms (from aq. HCl). On diazotization, (E) yields 2,4-(MeO)BrC<sub>6</sub>H<sub>2</sub>OMe, m. 123°. Bromination of 2,4-MeO(AcHN)C<sub>6</sub>H<sub>2</sub>OMe in either CHCl<sub>3</sub> or AcOH yielded only 2,4,5-MeO(AcHN)BrC<sub>6</sub>H<sub>2</sub>OMe, needles, m. 127–8°, which on careful treatment with KOH in MeOH, yielded 5-bromo-4-aminoveratrole (G), needles from MeOH, m. 51°. The benzoyl derivative, needles, m. 142°. The constitution of (G) was shown by diazotization and conversion into (the known) 2,4,5-MeOBrC<sub>6</sub>H<sub>2</sub>OMe, m. 92°. 2,3,4-MeO(AcHN)(HO<sub>2</sub>C)C<sub>6</sub>H<sub>2</sub>OMe in AcOH, when treated with Br in AcOH, yielded 5-bromo-2-acetylaminoveratric acid (H), fine needles, m. 188–9°. When the reaction is carried out in CHCl<sub>3</sub> (H) is formed together with (E). On hydrolysis, (H) gave 5-bromo-2-aminoveratric acid, colorless prisms, m. 158–9°, the constitution of which was shown by its conversion into 5-bromoveratric acid, m. 191°. The bromination of 5-acetaminoveratric acid in AcOH gave rise to 2-bromo-5-acetaminoveratric acid, 2,3,4,5-Br(MeO)<sub>2</sub>(AcHN)C<sub>6</sub>HCO<sub>2</sub>H, needles from aq. alc., m. 221°, which on hydrolysis yielded 2-bromo-5-aminoveratric acid, prisms, m. 183°. The latter, on diazotization, gave 2-bromoveratric acid, m. 201–2°. 6-Acetaminoveratric acid, when brominated in CHCl<sub>3</sub> suspension, yielded 2,4,5-MeO(AcHN)BrC<sub>6</sub>H<sub>2</sub>OMe, m. 127–8°. No other product was isolated.

LOUIS E. WISE.

**Relative activity of certain alkyl iodides with sodium  $\alpha$ -naphthoxide.** HENRY E. COX. *J. Chem. Soc.* 113, 821–4(1918); cf. *C. A.* 13, 312.—The interaction of MeI and Na  $\alpha$ -naphthoxide (A) in MeOH at 40° was studied. The reaction is bimol., and the velocity coeff. increases with diln. in accordance with the equation:  $k_p = k_1 + a \log v$ , as far as  $v = 8$ . Thereafter the increase is more rapid. Variations in the concn. of MeI have little effect on the rate of reaction but changes in the initial concn. of (A) affect the velocity coeff. very appreciably. The coeff. is not affected by NaI, but  $\alpha$ -C<sub>10</sub>H<sub>7</sub>OMe (the other product of the interaction of (A) with MeI) greatly retards the reaction. The velocity of the reaction between MeI, EtI and PrI and (A), is about twice as great (in each case) in EtOH as it is in MeOH. The relative activities of the alkyl iodides are as follows: MeI > EtI > PrI.

LOUIS E. WISE.

**Theory of the electrochemical hydrocarbon synthesis of Hermann Kolbe.** F. FICHTER AND E. KRUMMENACHER. *Helvetica Chimica Acta* 1, 146–66(1918); *Arch. sci. phys. nat.* 44, 383–4(1917).—Two theories have been formulated to explain the formation of hydrocarbons by the electrolysis of salts of fatty acids (Kolbe's synthesis). Crum, Brown and Walker (*Ann.* 261, 107(1891)) seek to explain the mechanism of the reaction on the basis of lost charges from the anion, as follows:  $2R.COO^- + 2^+ \longrightarrow 2RCOO \longrightarrow R-R + 2CO_2$ ; whereas Schall (*Z. Elektrochem.* [3] 83 (1896)) states that acid peroxides are first formed (at the anode) which then decomp. to yield CO<sub>2</sub> and the hydrocarbon:  $RCO_2-CO_2R \longrightarrow R-R + 2CO_2$ . Although C., B. and W.'s theory has gained preëminence, F. and K. are inclined towards S.'s peroxide theory, which is apparently supported by their own exptl. work with acyl peroxides. (AcO)<sub>2</sub>, prepd. by Clover and Richmond's method (*J. Am. Chem. Soc.* 29, 179) explodes readily and is hardly suitable for quant. experimentation. It appears to decomp. (in part at least) into CO<sub>2</sub> and C<sub>2</sub>H<sub>6</sub>, and CH<sub>4</sub> is an appreciable by-product in the reaction. (Et-CO<sub>2</sub>)<sub>2</sub> (A), which is a liquid, far more stable than (AcO)<sub>2</sub>, was formed by Clover's



method (Thesis, Univ. Michigan, 1914). (A) explodes at 80°, but decomps. rather gradually when heated at 60°. Products of decompn. were butane, CO<sub>2</sub>, CH<sub>4</sub> and EtCO<sub>2</sub>Et. The principal reaction is probably represented by the following equation:  $2(A) \longrightarrow C_4H_{10} + 2CO_2$ . The formation of CH<sub>4</sub> may perhaps be explained by the hydrolysis of (A):  $(A) + H_2O \longrightarrow CH_4 + CO_2 + MeCOCO_2H$ . EtCO<sub>2</sub>Et is produced in very small amt. *Perpropionic acid* (B), EtCO<sub>2</sub>H, which was formed by the action of pure H<sub>2</sub>O<sub>2</sub> upon (EtCO)<sub>2</sub>O (cf. Ahrle, *J. prakt. Chem.* [2] 79, 129(1909)) is far less explosive than MeCO<sub>2</sub>H. The decompn. of (B), effected by heating in a steel autoclave, gave rise to CO<sub>2</sub>, mixed with smaller amts. of CH<sub>2</sub>:CH<sub>2</sub>, C<sub>2</sub>H<sub>4</sub> and CH<sub>4</sub>. It appears that the decompn. of (B) at moderate temp. gives rise to EtOH and CO<sub>2</sub>, whereas CH<sub>2</sub>:CH<sub>2</sub>, H<sub>2</sub>O and CO<sub>2</sub> are formed when (B) is heated to a higher temp.

LOUIS E. WISE.

**Nitrones and nitrenes.** H. STAUDINGER AND K. MIESCHER. *Arch. sci. phys. nat.* 44, 387-8(1917).—The nitrones and nitrenes prep'd. by S. and M. bear the same relation to PhNO<sub>2</sub> as Ph<sub>2</sub>C:C:O (ketene) and Ph<sub>2</sub>C:C:CPh<sub>2</sub> (allene) bear to CO<sub>2</sub>. The nitrones also resemble the ketenes in intensity of color and in their chem. activity. Phenyl diazomethane reacting with PhNO yields the *nitrone*, PhCH:NPh:O (A), which is identical with the comp'd. obtained by the interaction of BzH and PhNHOH. (A) unites with either 1 or 2 mols. of Ph<sub>2</sub>C:C:O (B) (diphenylketene). The addition product of (A) with 1 mol. (B) loses CO<sub>2</sub> when heated, yielding the *nitrene* (C) Ph<sub>2</sub>C:NPh:CPh<sub>2</sub>. The nitrenes add 1 but not 2 mols. of (B). The addition product derived from (B) and (C) is represented by the formula:  $\text{PhN} \cdot \text{CPh}_2 \cdot \text{CO} \cdot \text{CPh}_2 \cdot \text{CPh}_2$ . Physical

properties of the above compds. are not given.

LOUIS E. WISE.

**Contribution to the study of holocaine.** L. REUTTER DE ROSEMONT. *Arch. sci. phys. nat.* 44, 389-90(1917).—An unsuccessful attempt to synthesize holocaine (A) is described. The interaction at 40° of 32 g. (EtOC<sub>4</sub>H<sub>9</sub>NH)<sub>2</sub>CS and 12 g. KCN in 40 g. H<sub>2</sub>O, in the presence of 75 g. PbCO<sub>3</sub> and 100 g. EtOH, gave rise to the *nitrite*, EtOC<sub>4</sub>H<sub>9</sub>NHC(CN):NC<sub>4</sub>H<sub>9</sub>OEt (B), yellow prisms from Et<sub>2</sub>O, m. 104°. When 40 g. (B) was heated at 30-45° with 150 g. yellow (NH<sub>4</sub>)<sub>2</sub>S, the compound, EtOC<sub>4</sub>H<sub>9</sub>NHC-[C(NH<sub>2</sub>):S]:NC<sub>4</sub>H<sub>9</sub>OEt, yellow prisms, m. 124°, was obtained. The latter when heated on the water bath with HCl gave rise to the compound (C), C<sub>11</sub>H<sub>27</sub>O<sub>2</sub>N<sub>2</sub>Cl (probably EtOC<sub>4</sub>H<sub>9</sub>NH(HCl)C(CONH<sub>2</sub>):NC<sub>4</sub>H<sub>9</sub>OEt), cream-colored crystals, m. 220°. Reduction of (C) by means of Na or NaHSO<sub>3</sub> did not yield (A).

LOUIS E. WISE.

**Steric hindrance.** S. REICH. *Arch. sci. phys. nat.* 44, 403-4(1917).—The reactivity of *o*-disubstituted aldehydes does not decrease with increasing wt. of the substituent group. 2,6-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO (A) is in fact more reactive than 2,6-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CHO (B), which in turn is more active than 2,4,6-Me<sub>3</sub>C<sub>6</sub>H<sub>3</sub>CHO (C). (A), when heated with AcONa and Ac<sub>2</sub>O for 2 hrs. at 140-5°, is quant. converted into 2,6-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH:CHCO<sub>2</sub>H. Under similar conditions (B) gives a 30-40% yield of 2,6-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH:CHCO<sub>2</sub>H and an 80% yield of this acid when the reaction is carried out at 180°. R. was unable to convert (C) into 2,4,6-Me<sub>3</sub>C<sub>6</sub>H<sub>3</sub>CH:CHCO<sub>2</sub>H. The presence of 2Cl atoms (in positions 2 and 6) reduces the reactivity of a CO<sub>2</sub>Et group towards PhMgBr, but such an effect is not apparent in the case of (B), which reacts very readily with PhMgBr.

LOUIS E. WISE.

**Study of the acid function in methenic and methinic acids.** J. GUINCHANT. *Ann. chim.* (9) 9, 49-143; 10, 30-84(1918).—(From a thesis submitted at the Univ. of Sorbonne in 1897 and not previously published in any scientific journal.) To det. the constitution of methenic and methinic acids expts. were made with a number of acids of each type. In the group of methinic acids the following new cyanoacetic acids were prep'd., using the method of Haller which consists in heating together the acyl chloride

with the Na salt of the cyanoacetic ester: *methyl propionylcyanoacetate*,  $\text{EtCOCH}(\text{CN})\text{CO}_2\text{Me}$ , long silky needles from  $\text{Et}_2\text{O}$ , m.  $30^\circ$ ,  $b_{25} 136^\circ$ , very slightly sol. in  $\text{H}_2\text{O}$  but sol. in  $\text{Et}_2\text{O}$  and  $\text{CHCl}_3$ ; *sodium salt*, needles, containing 1 mol. of  $\text{H}_2\text{O}$  which lost its  $\text{H}_2\text{O}$  when heated at  $100^\circ$  under reduced pressure; *copper salt*, blue-green spangles, insol. in  $\text{H}_2\text{O}$  but sol. in  $\text{CHCl}_3$  and hot  $\text{EtOH}$ ; *methyl butyrylcyanoacetate*,  $b_{25} 148^\circ$ , which crystd. on cooling and melted at  $0-1^\circ$ ; *sodium salt*, fine needles contg. 2 mols. of  $\text{H}_2\text{O}$  which changed to the anhydrous salt on heating in a vacuum; *copper salt*, dark green crystals from  $\text{EtOH}$ ; *methyl isobutyrylcyanoacetate*, m.  $36-7^\circ$ ,  $b_{25} 139-40^\circ$ , slightly sol. in  $\text{H}_2\text{O}$  but sol. in ligroin or  $\text{PhH}$ ; *sodium salt*, with 1 mol. of  $\text{H}_2\text{O}$  which it lost on drying under reduced pressure; *copper salt*, green plates from  $\text{EtOH}$ ; *propyl acetylcyanoacetate*, fine needles from ligroin, m.  $35-6^\circ$ ,  $b_{25} 133^\circ$ ; *sodium salt*, with 2 mols. of  $\text{H}_2\text{O}$  and becoming anhydrous when dried *in vacuo*; *copper salt*, blue-green plates; *isobutyl acetylcyanoacetate*,  $b_{25} 142^\circ$ ; *sodium salt* containing 4 mols. of  $\text{H}_2\text{O}$  which when kept *in vacuo* at  $20^\circ$  lost 2 of the mols. of  $\text{H}_2\text{O}$  and lost the remaining 2 mols. when kept at  $100^\circ$  *in vacuo*; *copper salt*; *amyl acetylcyanoacetate*,  $b_{25} 168^\circ$ ,  $[\alpha]_D^{25} 2.51^\circ$ ; *sodium salt*, a viscous liquid which crystd. on long standing; *copper salt*, blue-green plates from hot  $\text{PhNO}_2$ . The following other methenic and methinic compds. were similarly prepd. (in some cases they were purchased:  $\text{CH}_3(\text{CN})\text{CO}_2\text{CHMe}_2$ ,  $\text{CH}_3(\text{CN})\text{CO}_2\text{C}_6\text{H}_{11}$ ,  $\text{AcCH}(\text{CO}_2\text{Et})_2$ ,  $(\text{Ac})_2\text{CHCO}_2\text{Et}$ ,  $\text{AcCH}(\text{CN})\text{CO}_2\text{Me}$ ,  $\text{AcCH}(\text{CN})\text{CO}_2\text{Et}$ ,  $\text{Me}(\text{CH}_2)_2\text{COCH}(\text{CN})\text{CO}_2\text{Me}$ ,  $\text{BzCH}(\text{CN})\text{CO}_2\text{Et}$ ,  $(\text{CN})_2\text{CHCO}_2\text{Et}$ ,  $\text{CNCH}(\text{CO}_2\text{Me})_2$ ,  $\text{CNCH}(\text{CO}_2\text{Et})_2$ ,  $\text{CH}_3(\text{CN})\text{CO}_2\text{Me}$ ,  $\text{CH}_3(\text{CN})\text{CO}_2\text{Et}$ ,  $\text{AcCH}_2\text{Ac}$ ,  $\text{AcCH}_2\text{CO}_2\text{Me}$ ,  $\text{AcCH}_2\text{CO}_2\text{Et}$ ,  $\text{CH}_2(\text{CO}_2\text{Me})_2$ ,  $\text{BzCH}(\text{CN})\text{Ac}$ ,  $\text{CH}_3(\text{CN})\text{CONH}_2$ ,  $\text{CH}_3(\text{CONH})_2$ ,  $\text{CH}_3(\text{CN})\text{CO}_2\text{H}$ , and  $\text{BzCN}$ . To det. the constitution of the above compds. five methods were used: the lowering of the f. p. in a  $\text{H}_2\text{O}$  soln. of the Na salts; the cond. of the free acids and the Na salts; the heat of neutralization in the formation of the Na salts; mol. wt. in  $\text{PhH}$  (cryoscopic method); and the heat of combustion. The Na salts of both the methenic and methinic acids gave about the same lowering of the f. p. in  $\text{H}_2\text{O}$  as do the salts of the corresponding fatty acids, and they also show about the same cond. The cond. of the free methenic acids were too small to measure with accuracy, while the free methinic acids gave a much greater ionization const. than the corresponding fatty acids. With  $\text{AcCH}_2\text{Ac}$  the cond. changed with time, due probably to the hydrolysis of the acid to form  $\text{AcOH}$ , and moreover when first placed in soln. the cond. was too small to measure with accuracy. The mol. wt. of the methinic acids when measured cryoscopically in  $\text{PhH}$  gave numbers more analogous to neutral compds. than to the corresponding fatty acids. In their heats of combustion both methenic and methinic acids behaved as though they were ketones,  $\text{AcCH}_2\text{Ac}$  alone being an exception and giving a heat of combustion more like an enolic compd.

R. N. HARGER.

**Synthesis of 1,4,7-trihydroxyheptane, a homolog of ordinary glycerol, and various derivatives of propyltetrahydrofurfuran.** J. HAMONET. *Ann. chim.* 10, 5-30(1918). —When the Mg alkyl compd. of 1,3-methoxypropyl iodide (Grignard reagent) was mixed in  $\text{Et}_2\text{O}$  with  $\text{HCO}_2\text{Et}$  a vigorous reaction took place, producing 1,7-dimethoxy-4-hydroxyheptane,  $(\text{MeOCH}_2\text{CH}_2)_2\text{CHOH}$  (A), together with small quantities of  $\text{MeO}(\text{CH}_2)_4\text{OMe}$  and an aldehyde, probably  $\text{MeO}(\text{CH}_2)_3\text{CHO}$ , the three compds. being sep'd. by fractional distn. (A) is a very bitter liquid, b.  $254-6^\circ$ ,  $b_{25} 141-2^\circ$ ,  $d_{18} 0.969$ ,  $n_D^{18} 1.440$ . When  $\text{PBr}_3$  was allowed to react with (A) the result was 1,7-dimethoxy-4-bromoheptane (B),  $b_{25} 137-9^\circ$ . With  $\text{PCl}_5$  there was formed the corresponding compd., 1,7-dimethoxy-4-chloroheptane, a volatile liquid of very disagreeable odor,  $b_{18} 120-2^\circ$ . H. was unable to isolate the corresponding I compd. either by treating (A) with  $\text{PI}_3$  or (C) with  $\text{KI}$  for in both cases there was formed:  $\text{MeO}(\text{CH}_2)_3\text{CHCH}_2\text{CH}_2\text{CH}_2\text{O}$ .

When  $\text{HI}$  gas was allowed to interact with (A) there resulted 1,4,7-triiodoheptane,<sup>2</sup>

viscid liquid,  $d_{18}$  2.343. The corresponding Br compd., 1,4,7-tribromoheptane (*E*),  $b_{10}$  184-7°,  $d_{18}$  1.775, was obtained by satg. (*A*) with HBr, while if the proportion of HBr was limited and the reaction mixt. cooled in ice the resulting product was 1,7-dibromo-4-hydroxyheptane (*F*),  $d_{18}$  1.620. When an attempt was made to dist. (*F*) it lost half of its Br and formed 3-bromopropyl- $\alpha$ -tetrahydrofurfuran,  $\text{BrCH}_2(\text{CH}_2)_2\text{CH}(\text{CH}_2\text{CH}_2\text{CH}_2\text{O})$  (*G*), a colorless liquid, insol. in  $\text{H}_2\text{O}$ ,  $b_{27}$  115-6°,  $d_{10}$  1.331,  $n_D^{20}$

1.485. Treated with HBr (*G*) yielded (*F*). Compds. (*E*), (*F*) and (*G*), when boiled with  $\text{H}_2\text{O}$ , lost all Br in their mols. and all gave 3-hydroxypropyl- $\alpha$ -tetrahydrofurfuran (*H*), colorless liquid,  $b_{100}$  222-3°,  $b_{18}$  119-20°,  $d_{18}$  1.007,  $n_D^{18}$  1.445, while *H*, when boiled with HBr, was converted into (*E*). The acetate of 3-acetoxypentyl- $\alpha$ -tetrahydrofurfuran,  $b_{14}$  118-20°,  $d_{18}$  1.0201,  $n_D^{18}$  1.448, was formed by treating (*H*) with  $\text{Ac}_2\text{O}$  and  $\text{ZnCl}_2$  as a catalyst, below 125°, while if the temp. was kept at 145-50° the resulting product was 1,4,7-triacetoxypentane,  $[\text{AcOCH}_2(\text{CH}_2)_2]_3\text{CHOAc}$  (*I*),  $b_{17}$  200-2°,  $d_{18}$  1.0872,  $n_D^{18}$  1.447. (*I*) was also obtained by treating (*D*) or the corresponding tri-I compd. with  $\text{AgOAc}$ . On sapong. (*I*) with  $\text{Ba}(\text{OH})_2$ , there resulted 1,4,7-trihydroxyheptane (*J*), a viscid liquid with a sweet taste,  $b_{28}$  230-2°,  $d_6$  1.084,  $d_{18}$  1.075,  $n_D^{18}$  1.4378. It was found that (*J*) could be formed much more easily by treating 1 mol. of (*A*) with 2 mols. of gaseous HI. When (*J*) was boiled with  $\text{H}_2\text{SO}_4$  (1-5 or 1-20) water was split off from (*H*). That the ring closes in these cases in the  $\gamma$ -position was further shown by the fact that when 1,4-dibromobutane was boiled with  $\text{H}_2\text{O}$  the resulting product was tetrahydrofurfuran while the same compd. was formed by boiling 1,4-diiodobutane with  $\text{Ag}_2\text{O}$ .

R. N. HARGER.

The nitro derivatives of phenyl-2-naphthylamine. HUGH RYAN AND JAMES J. DRUMM. Univ. College, Dublin. *Proc. Roy. Irish Acad.* 34B, 165-74.—This investigation was undertaken to det. whether the stabilizing properties of phenylacetyl-2-naphthalide (*A*) for nitrocellulose powders are due to its power of combining with  $\text{HNO}_3$  and  $\text{HNO}_2$  to its action as a negative accelerating agent or to its gelatinizing properties.  $\text{NO}_2$ , the nitrating constituent of dry nitrous fumes, prepd. by heating dry  $\text{Pb}(\text{NO}_2)_2$ , has no action on (*A*) in anhydrous  $\text{Et}_2\text{O}$  but in moist  $\text{Et}_2\text{O}$  phenyl-2-naphthylamine (*B*) (white prisms from  $\text{C}_6\text{H}_6$ , m. 107°) occurs by hydrolysis and upon evapn. of the  $\text{Et}_2\text{O}$  soln. colorless cubical crystals, m. 119-20°, were obtained by recrystn. from boiling xylene. This compd. was a mono- $\text{NO}_2$  deriv. of (*B*). The following results indicate that the 119° product is probably 3-nitrophenyl-2-naphthylamine: 1-Nitrophenyl-2-naphthylamine was prepd. by Goldberg's method (*Ber.* 40, 4541(1907)) in which the reaction between the amine and the halogen compd. proceeds in  $\text{PhNO}_2$  soln. in the presence of Cu dust, KI, and  $\text{K}_2\text{CO}_3$ . It crystd. from hot alc. as deep red prisms, m. 105-6°, insol. in dil. alc. HCl, sol. in  $\text{Et}_2\text{O}$ , glacial AcOH, or  $\text{C}_6\text{H}_6$ ; sparingly sol. in cold and easily in hot alc. Its soln. in cold concd.  $\text{H}_2\text{SO}_4$  had a deep red color. 4'-Nitrophenyl-2-naphthylamine was prepd. from  $p\text{-BrC}_6\text{H}_4\text{NO}_2$  with 2- $\text{C}_{10}\text{H}_7\text{NH}_2$  (Goldberg). During the removal of  $\text{PhNO}_2$  by steam distn. in these expts. alkali carbonate was neutralized since it attacks many of these  $\text{NO}_2$  compds. Extn. of the soln. with hot  $\text{C}_6\text{H}_6$  after steam distn. yielded yellow crystals, m. 283-4°, readily sol. in  $\text{C}_6\text{H}_6$ , sparingly sol. in cold alc. or  $\text{Et}_2\text{O}$ , and giving a violet-blue color with concd.  $\text{H}_2\text{SO}_4$ . When (*A*) was treated with  $\text{NO}_2$  in abs. alc. a crusty solid sepd. which recrystd. from glacial AcOH in yellow prisms, m. 242-3°, later found to be 2',4',1-trinitrophenyl-2-naphthylamine. From the parent liquid another tri- $\text{NO}_2$  deriv. of (*B*) was obtained by pptn. with  $\text{H}_2\text{O}$  and recrystn. from AcOH; orange prisms, m. 179-80°. Neither of the above compds. is formed when an alc. soln. of the stabilizer (*A*) is treated with colorless concd.  $\text{HNO}_3$  (1-10 mols.) at room temp. 10 days. When (*A*) was triturated with  $\text{HNO}_3$  (d. 1.43) a red sirup formed, which on pouring into  $\text{H}_2\text{O}$  yielded a ppt. This

product, filtered and washed with  $H_2O$ , recrystd. from xylene in yellow cubes, m.  $119-20^\circ$ , identical with that formed by  $NO_2$  in moist  $Et_2O$ . In  $AcOH$  (A) is not acted on by  $HNO_3$  but upon adding  $AmNO_2$ , the yellow tri- $NO_2$  compd., m.  $242^\circ$ , and the orange one, m.  $179^\circ$ , were formed.  $HNO_3$  was slowly added to (B) in  $Et_2O$ . Upon evapn. of the  $Et_2O$  and recrystn. from glacial  $AcOH$ , trinitrophenyl-2-naphthylamine sepd., prisms, m.  $210^\circ$  (decompn.). Addition of  $HNO_3$  to (B) directly, yielded impure resinous products.  $HNO_3$  reacted with (B) in glacial  $AcOH$ , forming crystals, part of which dissolved in boiling glacial  $AcOH$  to form dinitrophenyl-2-naphthylamine, m.  $192-5^\circ$  (Streiff, *Ann.* 209, 157(1881)). The less sol. portion was the orange tri- $NO_2$  compd., m.  $179-80^\circ$ . For exptl. purposes, phenyl-2-naphthylnitrosoamine (C) was prepd. by heating a mixt. of abs. alc. and iso- $AmNO_2$  under a reflux. The pale gray prisms which sepd. on standing were colorless after treatment with animal charcoal; m.  $98^\circ$ , decomp. when boiled with glacial  $AcOH$  or when treated with dil. acids. In abs. alc. (C) is reacted upon by concd.  $HNO_3$  to form a reddish amorphous solid. This product, filtered and crystd. from glacial  $AcOH$  as brown prisms, m.  $170-80^\circ$  (decompn.), was a di- $NO_2$  deriv. of (B). In  $AcOH$  soln., (C) is transformed by  $HNO_3$  (1-6 mol.) into the yellow tri- $NO_2$  compd. of (B), m.  $242-3^\circ$ . The  $242^\circ$  compd. was 2',4',1-trinitrophenyl-2-naphthylamine, prepd. from 2,4-( $O_2N$ ) $_2$  $C_6H_3Cl$  with 1,2- $C_{10}H_7$ ( $NO_2$ ) $_2NH_2$  by Goldberg's method. 2',4'-Dinitrophenyl-2-naphthylamine was made from 2- $C_{10}H_7NH_2$  and 2,4-( $O_2N$ ) $_2$  $C_6H_3Cl$ , crystd. from glacial  $AcOH$  in red prisms, m.  $170-1^\circ$  (Ernst, *Ber.* 23, 3429(1890), and Heim, *Ber.* 21, 589(1888), who used *m*- $C_6H_4$ ( $NO_2$ ) $_2$ ). 2',4',6'-Trinitrophenyl-2-naphthylamine was obtained by heating  $\beta$ - $C_{10}H_7NH_2$  with picryl chloride or Me picrylnitrosoamine (Bamberger and Mueller, *Ber.* 33, 107(1900)), brick-red prisms from glacial  $AcOH$ , orange-yellow from dil.  $AcOH$ , either variety m.  $230^\circ$  (uncorr.). Picryl chloride did not react with 1,2- $C_{10}H_7$ ( $NO_2$ ) $_2NH_2$  even in boiling  $PhNO_2$ . [To obtain the 1,2- $C_{10}H_7$ ( $NO_2$ ) $_2NH_2$ , the corresponding acetanaphthalide (Kleeman, *Ber.* 19, 338(1886)) was first prepd. by nitration of aceto-2-naphthalide; yellow prisms from abs. alc., m.  $123-4^\circ$ . This compd. was hydrolyzed with alc.  $HCl$  to produce the amine, dark brown prisms from alc., m.  $123-4^\circ$ .] 1-Nitro-, 4'-nitro-, and 2',4',1-trinitro-2-naphthylaniline were successfully prepd. by Goldberg's method, but *o*- $NO_2C_6H_4Br$  would not react with 2- $C_{10}H_7NH_2$ , nor *o*- $NO_2C_6H_4NH_2$  with 2- $C_{10}H_7Cl$  under these conditions. From these results it is seen that (A) in alc. soln. treated with  $NO_2$  is first decompd. into the corresponding amine, which is partly nitrated directly to the orange tri- $NO_2$  deriv., m.  $179^\circ$ ; another part (75%) of the amine is converted into (C), which in turn is transformed by  $HNO_3$  into the yellow tri- $NO_2$  compd., m.  $242^\circ$ . For the formation of the latter  $HNO_3$  seems essential.

C. H. KIDWELL.

**Tartaric amides and imides.** II. LUIGI CASALE. Univ. Naples. *Gazz. chim. ital.* 48, I, 114-20(1918); cf. C. A. 12, 1174.—The easy alterability of  $p$ - $H_2NC_6H_4OH$  in the air and in heat makes the prepn. of its amido and imido derivs. with tartaric acid very difficult. Good results were obtained by heating the tartrate and  $p$ - $H_2NC_6H_4OH$  *in vacuo* with a strong dehydrating agent for a few hrs. at  $200^\circ$ . Only the imido deriv. was obtained. Not a trace of the amido deriv. was obtained as with  $PhNH_2$ . It is thought that this may be due to the fact that at this temp. the amido deriv. is unstable and loses  $H_2O$  to give the imido deriv.; no racemization was observed such as might be expected in such a case. A hot  $EtOH$  soln. of *d*-tartaric acid mixed with a hot  $EtOH$  soln. of  $p$ - $H_2NC_6H_4OH$  seps. *p*-aminophenol tartrate (a),  $HO_2C$ -( $CHOH$ ) $_2$ - $CO_2NH_2C_6H_4OH$ , slightly colored scales, m.  $232^\circ$ . (a) heated in a dry vacuum (special app. described) for a sufficient time at  $200^\circ$  melts, loses  $H_2O$ , and gives *p*-hydroxyphenyltartramide (b),  $(CH(OH)CO)_2NC_6H_4OH$ , colorless silky needles from boiling  $H_2O$ , m.  $299^\circ$  (decompn.); 0.3622 g. in 100 cc.  $MeOH$  gives  $[\alpha]_D^{20} +119.64^\circ$ ,

[M] + 267.0°. Unlike phenyltartramide (b) is not saponif. by boiling  $H_2O$ . (b) dissolved in concd.  $NH_4OH$ , in which it is very sol., and heated to 100°, acidified with dil.  $H_2SO_4$ , and cooled seps. *p*-monohydroxyphenyltartramide (c),  $H_2NCO.(CHOH)_2.CONHC_6H_4OH$ , prismatic needles, m. 227°; 0.8408 g. in 100 cc. MeOH gives  $[\alpha]_D^{18} +154^\circ$  and [M] +370°. It may also be prepd. by dissolving (b) in MeOH and passing dry  $NH_3$  into the soln.: (c) seps. on cooling. (c) heated at 150° with  $PhNH_2$  gives *p*-monohydroxydiphenyltartramide,  $PhNHCO.(CHOH)_2.CONHC_6H_4OH$ , silky needles, m. 253°. (c) heated for a short time with the calcd. amt. of 2 N KOH and acidified with concd. HCl gives *p*-hydroxyphenyltartramic acid (d), slightly colored hexagonal plates from  $H_2O$ , m. 218°; 0.550 g. in 100 cc.  $H_2O$  gives  $[\alpha]_D^{14} +108.3^\circ$  and [M] +261.0°; on heating it is slowly converted into the imide without melting. The esters of (d) were obtained by dissolving it in the alc. in question and passing dry HCl into the soln. The ester was obtained by evapg. the alc. Methyl *p*-hydroxyphenyltartrate was obtained as colorless needles, m. 206° with the loss of MeOH and formation of (b) which m. 296°; 0.3884 g. in 100 cc. MeOH gives  $[\alpha]_D^{15} +109.5^\circ$  and [M] +279°. The ethyl ester of (d) was obtained as white opaque plates, m. 118°; 0.3472 g. in 100 cc. MeOH gives  $[\alpha]_D^{15} +106.1^\circ$  and [M] +285.5°. The propyl ester of (d) appears as colorless rhombic tablets, m. 133°; 0.4016 g. in 100 cc. MeOH soln. gives  $[\alpha]_D^{15} +103.8^\circ$ , [M] +294°.

III. *Ibid* 47, II, 63-8(1917).—The importance of the nature of the acid radical substituted on the  $NH_2$  group of *p*-phenetidine in modifying the physiological properties of the derivs. is well known. The acetyl, propionyl, lactyl, dipropylacetyl, dipropylmalonyl, mandelyl and salicyl derivs. have been studied but have the disadvantage of low soly. in  $H_2O$  among others. Piutti prepared Na ethoxyphenylsuccinamate (sol. pyrrantene) and ethoxyphenylsuccinimide which are antithermic and free from secondary actions on the blood. These compds. are inaccessible on account of the high price of succinic acid and so C. has studied the tartaric acid derivs. chemically in detail. *p*-Phenetidine tartrate (a) was placed in a flat dish and kept in an oven at 150-5° for several hrs. The powder was boiled with  $H_2O$  (1 l. for 30 g.) and filtered hot. On cooling *p*-ethoxyphenyltartramide (b),  $(CH(OH)CO)_2NC_6H_4OEt$ , white microcrystals, m. 260°, is sepd.; is not saponif. on boiling with  $H_2O$ ; 0.581 g. in 100 g. MeOH gave  $[\alpha]_D^{14} 115.7^\circ$ , [M] 284°. The insol. residue obtained in the prepn. of (b) is diethoxyphenyltartramide (c),  $[CH(OH)CONHC_6H_4OEt]_2$ , rhombic plates, m. 282°. (c) becomes the main product when the dehydration of (a) is carried out at the m. p. of (a). (c) is also obtained by heating (b) with an equal amt. of *p*-phenetidine at 150-60° for a few min. and crystg. from AcOH. (c) is quickly purified by boiling with  $Me_2CO$  or MeOH; it is nearly insol. in common organic solvents. (b) in hot concd.  $NH_4OH$  is converted into monoethoxyphenyltartramide,  $H_2NCOCH(OH)CH(OH)CONHC_6H_4OEt$ , colorless tablets, m. 237° (decompn.), which seps. on cooling. It is also obtained on passing  $NH_3$  into the hot MeOH soln. of (b). (b) heated a short time at 100° with the calcd. amt. of 2.0 N KOH and acidified with concd. HCl gives ethoxyphenyltartramic acid,  $HO_2CCH(OH)CH(OH)CONHC_6H_4OEt$ , leaves from AcOH, m. 201°, giving the imide; 0.2451 g. in 100 g.  $H_2O$  gave  $[\alpha]_D^{14} 107.1^\circ$ , [M] 288.2°. 2 g. (b) were treated with 10 g. MeOH satd. with HCl gas on a  $H_2O$  bath. On cooling fine prisms of methyl ethoxyphenyltartrate,  $MeO_2CCH(OH)CH(OH)CONHC_6H_4OEt$ , sepd., m. 191°; 0.3952 g. in 100 g. MeOH gave  $[\alpha]_D^{15} 101.2^\circ$ , [M] 286.5°. Ethyl ethoxyphenyltartrate, colorless prisms, m. 175°; 0.16120 in 100 g. MeOH gave  $[\alpha]_D^{14} 98.72^\circ$ , [M] 293.5°.

E. J. WITZEMANN.

The influence of some hydroxy acids on the electric conductivity of boric acid. J. BÖRSEKIN AND H. KALSHOVEN. Delft. *Rec. trav. chim.* 37, 130-43(1918).—The expts. were made with glycolic,  $\beta$ -phenyl- $\alpha$ -hydroxypropionic,  $\beta$ -phenyl- $\beta$ -hydroxy-

propionic and diglycolic acids. The diglycolic acid (a) was prepd. according to Ehlert (*Thesis*, Königsbergen, 1901). 875 g.  $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$  were dissolved in 1 l. hot water. To the cool soln. 250 g.  $\text{ClCH}_2\text{CO}_2\text{H}$  were added and the mixt. was boiled under a reflux for 1 hr. Much Ba diglycolate seps. The dry salt,  $\text{Ba}(\text{O}_2\text{C})_2\text{C}_2\text{H}_4\text{O} \cdot \text{H}_2\text{O}$ , was decompd. with the calcd. amt. of  $\text{H}_2\text{SO}_4$  and evapd. in order to obtain the free acid (a). The substitution of OH in  $\text{CH}_2(\text{OH})\text{CO}_2\text{H}$  with  $\text{OCH}_2\text{CO}_2\text{H}$  causes the product to have a negative action on the cond. of  $\text{H}_2\text{BO}_3$ . Although the two  $\text{CO}_2\text{H}$  groups are in a favorable position for cyclic anhydride formation this does not occur. (a) thus behaves as do succinic and glutaric acids.  $\beta$ -Phenyl- $\beta$ -hydroxypropionic acid (b),  $\text{PhCH}(\text{OH})\text{CH}_2\text{CO}_2\text{H}$ , was prepd. according to Fittig and Binder (*Ann.* 195, 138(1878)). When aq. solns. of (b) are mixed with  $\text{H}_2\text{BO}_3$  the cond. is only slightly less than the sum of the conductivities of the component solns.  $\beta$ -Phenyl- $\alpha$ -hydroxypropionic acid (c),  $\text{PhCH}_2\text{CH}(\text{OH})\text{CO}_2\text{H}$ , was obtained from cinnamic acid by converting it into  $\text{PhCH}_2\text{CHO}$  by the known method (*Ann.* 147, 79(1867); 219, 105(1883); *J. prakt. Chem.* 84, 443) except that  $\text{NaOCl}$  was used. The 50% yield of  $\text{PhCH}_2\text{CHO}$  was quant. converted into  $\text{PhCH}_2\text{CH}(\text{OH})\text{CN}$  and sapond. with  $\text{HCl}$  to give (c). The influence of (c) on the cond. of  $\text{H}_2\text{BO}_3$  is strongly positive and nearly equal to that of lactic acid (*C. A.* 11, 38). Thus the substitution of Ph for H in  $\text{CH}_2$  is without appreciable effect. Verkade and B. (*C. A.* 11, 2895) found that the lowering of the cond. of any acid in 0.5 M  $\text{H}_2\text{BO}_3$  is normal and that the positive influence found with  $\alpha$ -HO acids increases with the cond. of the acid. Earlier data on  $\alpha$ -HO acids from *C. A.* 10, 1856, etc., are given in corrected form and discussed. The curve for pyruvic acid is more sharply inclined, which is interpreted as being due to more complete dissociation on diln. than for the  $\alpha$ -HO acid- $\text{H}_2\text{BO}_3$  complex.

E. J. WITZEMANN.

The influence of some nitrogen derivatives on the conductivity of boric acid. J. BÖRSEKEN, W. STURM AND G. GOETTSCH. Delft. *Rec. trav. chim.* 37, 144-61(1918).—In continuing expts. on the cond. of mixts. of  $\text{H}_2\text{BO}_3$ , compds. containing  $\text{HN} \cdot \text{CO} \cdot \text{NH}$  and  $\text{C}(\text{NH}_2)\text{CO}_2\text{H}$  were used. The ease with which  $\alpha$ - $\text{H}_2\text{NC}_6\text{H}_4\text{OH}$  and  $\alpha$ - $\text{C}_6\text{H}_4\text{C}(\text{NH}_2)_2$  form cyclic compds. with 5 or 6 atoms suggested that they might form highly conductive boro-complexes. Urea, biuret, alloxan, alloxantine, glycine, glutamic, cyanuric and dialuric acids, dihydroxyquinazoline (quinoxaline) and finally uric acid glycol were used. With the exception of glycine and perhaps uric acid glycol these compds. changed the cond. of  $\text{H}_2\text{BO}_3$  solns. only in the normal negative way. The detns. offered some difficulty because of instability of the aq. solns. during the passage of the current. A series of detns. was made and extrapolated to zero time. The urea solns. were quite stable. The biuret was prepd. by heating the urea for some hrs. at 150-70°. After cooling the residue was extd. with cold  $\text{H}_2\text{O}$  and evapd. to dryness. The residue, a mixt. of biuret and urea, was purified by crystn. Cyanuric acid was obtained by heating a mixt. of 10 g.  $\text{CO}(\text{NH}_2)_2$  + 20 g.  $\text{ZnCl}_2$  (anhydrous) at 230°.  $\text{ZnCl}_2$ ,  $\text{CO}(\text{NH}_2)_2$  and biuret were extd. with  $\text{HCl}$ . The increase in cond. for mixts. of  $\text{H}_2\text{BO}_3$  + glycine, with which a boric acid complex is formed, increases with concn., as for the  $\alpha$ -HO acids, but the power to form complexes is less pronounced. The glutamic acid used was prepd. from casein. Dihydroxyquinazoline (quinoxaline) (a) was obtained by the action of  $(\text{CO}_2\text{H})_2$  on  $\alpha$ - $\text{C}_6\text{H}_4(\text{NH}_2)_2$  at 140-60°. Of the two formulas possible for (a) the ketone form should, it seemed, have a slight negative action on the cond. of  $\text{H}_2\text{BO}_3$ , while the enol form should sharply increase the cond. The results favor the ketone formula. Alloxan was chosen because it combines very firmly with a mol. of  $\text{H}_2\text{O}$ . Cond. measurements were difficult with alloxan because of the rapid increase. From the study made with the free compd. it was concluded that its cond., i. e., its acidity, is quite small, in fact  $K = 5 \times 10^{-9}$  is a high figure. In the presence of 0.5 M  $\text{H}_2\text{BO}_3$  the decompn. is retarded but no increase in the acidity of

alloxan was observed. The results conform with the observations of Matignon (*Ann. chim. pharm.* [6] 28, 323(1893)) on the heats of hydration of alloxan. Thus the presence of 2 OH groups bound to a C atom between 2 CO groups is not sufficient for the formation of a  $H_2BO_3$  complex. Dialuric acid (hydroxybarbituric acid) (b) was chosen because of its resemblance to alloxan. Its structural formula may be written in the ketone or enol forms. The latter should have a marked positive influence on the cond. of  $H_2BO_3$ . (b) was prepd. as follows: 16 g. uric acid in 20 cc. HCl (d. 1.19) + 50 cc.  $H_2O$  were boiled under a reflux condenser while 3 g.  $KClO_3$  were gradually added. The alloxan obtained was poured into a hot soln. of 16 g. Sn in 50 cc. HCl (d. 1.19) to which 80 cc. concd. HCl were then added: (b) sepd. as needles after 24 hrs. but contained some alloxantin. To remove this it was heated with 1:1 HCl to which pieces of Sn were added until all alloxantin disappeared. The soln. was heated to boiling in a Jena flask and while cooling a current of  $H_2$  was passed. The cond. was detd. at 25°. In this way the disturbing influence of O in the soln. was eliminated. No increase in cond. was observed when 0.5 M solns. of  $H_2BO_3$  were added. This corresponds to the relation between carbonic and formic acids. (b) should be represented by the ketone formula. Alloxantin was prepd. by Liebig's method. Careful study of its behavior in aq. soln. showed that it is dissociated into dialuric acid and alloxan. The former is rapidly oxidized. This may be demonstrated electrolytically and verified by a microchem. examn. It has no positive action on the cond. of  $H_2BO_3$  and like (b) therefore does not contain two adjoining OH groups in the same plane. Uric acid glycol raises the cond. of  $H_2BO_3$  slightly. The 2 OH groups appear to be situated favorably in order to influence the  $H_2BO_3$ .

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**Preliminary note concerning the influence of boric acid on the electrical conductivity of diacetyl.** J. BÖRSEKEN with G. v. D. HOEK OSTENDE. Delft. *Rec. trav. chim.* 37, 161-4(1918).—B. (C. A. 11, 38) found that the cond. of pyruvic acid (a) undergoes a characteristic increase in 0.5 M  $H_2BO_3$  soln. Trimethylpyruvic acid behaves similarly (C. A. 12, 2548) so that it is probable that (a) hydrates itself thus,  $CH_3C(OH)_2CO_2H$ , and behaves like an  $\alpha$ -HO acid toward  $H_2BO_3$ . It is of interest to know if  $\alpha$ -diketones behave similarly. Diacetyl (b) obtained from com.  $MeCOEt$  through  $MeCOC(:NOH)Me$  was used because it is quite sol. in  $H_2O$ . The preliminary results show a marked positive effect of (b) on the cond. of  $H_2BO_3$  solns. and therefore that (b) is dihydrated in concd. solns. It will be of interest to exam. the influence of diln. on the absorption spectrum. Camphorquinone, a disubstituted  $\alpha$ -diketone, could be obtained only in  $1/100$  M concn. and at this diln. showed no effect on the cond. of (b). The positive effect of (b) diminished rapidly with diln. E. J. WITZEMANN.

**The influence of some  $\alpha$ -hydroxy acids on the electrical conductivity of boric acid.** J. BÖRSEKEN with MISSES J. WEISFELT, J. v. D. SPEK AND CHR. v. LOON AND G. GORTSCH. Delft. *Rec. trav. chim.* 37, 165-78(1918).—The methods were the same as those used in a previous report (preceding abstr.). The  $\alpha$ -hydroxycaprylic acid (a) was prepd. from enanthaldehyde. 58 g. of the latter were agitated with 180 cc. concd.  $NaHSO_3$  soln. until the mass became a thick paste of bisulfite. After filtering and washing with suction with cold  $H_2O$  the bisulfite was ground with 23 g. KCN in 25 g.  $H_2O$ . The oily cyanohydrin was sepd. and heated on the  $H_2O$  bath with 3 parts HCl (d. 1.19). On cooling the acid sepd. and was recrystd. from  $C_6H_6$ . (a) forms needles with a fatty luster. Incidentally the concd. aq. soln. is opalescent and the Na salt forms when agitated. Relatively concd. aq. solns. form 2 liquid layers at 25° when heated gently. Cond. measurements showed that there is a considerable increase in mixts. with  $H_2BO_3$ . Glyceric acid was obtained by oxidizing glycerol with  $HNO_3$  (Debus, *Ann.* 108, 80, 95). Although considerable efforts were made, pure glyceric acid was not obtained when the Pb salt recrystd. 6 times was decompd. with  $H_2S$ . The acid obtained

showed a very positive effect on the cond. of  $H_3BO_3$  mixed with it, but not greater than that of lactic acid. *Dihydroxymaleic acid* (b) was studied because of its uncertain constitution: it may be considered as an  $\alpha$ -hydroxy- $\alpha$ -ketonic or as a di- $\alpha$ -HO unsatd. acid. In case the latter name represents its constitution it should form a  $H_3BO_3$  complex even at great diln. Certain difficulties were encountered owing to the fact that (b) decomps. into glycolaldehyde and  $CO_2$  at  $25^\circ$ . The soly. of (b) at  $25^\circ$  does not exceed  $1/100$  M. With pyruvic acid the positive effect on  $H_3BO_3$  begins only at  $1/100$  M concns. The results show that the effect of (b) on the cond. of  $H_3BO_3$  is very great and is accentuated by diln., which argues in favor of the di-HO formula. Whether it is truly a maleic or fumaric deriv. could not be detd. Fenton's method (*J. Chem. Soc.* 65, 901(1894)) for preparing dihydroxymaleic acid was modified as follows: 0.004 part of Fe powder was dissolved in a satd. soln. of tartaric acid. The soln. was filtered and cooled with ice. Small portions of 6%  $H_2O_2$  were added from time to time until the color was not perceptibly changed in more than 3 min. after adding  $H_2O_2$ . 10% fuming  $H_2SO_4$  to the extent of 10% of the vol. of the soln. was now added while keeping the temp. below  $10^\circ$ . The mixt. was placed in an ice box and (b) filtered off and washed with cold  $H_2O$  later. The crystals were finely powdered, dissolved in  $H_2O$  previously heated to  $25^\circ$  in a thermostat and the cond. was observed as quickly as possible. The results show that in the presence of  $H_3BO_3$  the increase in cond. is considerable and increases on diln. The velocity of decompn. of (b) at  $25^\circ$  in aq. soln. follows a nearly rectilinear course: in 1 hr. nearly 40% is decompd.  $H_3BO_3$  exercises a positive effect on the cond. of (b), reduces the velocity of decompn. and this in spite of the increase in the  $H^+$  ion concn. In the  $H_3BO_3$  mixt. only 7% (b) is decompd. in the 1st hr. (b) is a stronger acid than oxalic:  $K > 1 \times 10^{-1}$  and the  $H_3BO_3$  complex is one of the strongest organic acids known. Gluconic acid was also examd. to see whether it behaves like the other  $\alpha$ -HO acids. The gradual increase in cond. of aq. solus. of the lactone was followed. The distribution of OH groups in the lactone is not very favorable while with the free acid we have the sum of 2 positive actions: that of the  $\alpha$ -HO acid and of the 4 OH groups. The increase in cond. in the presence of  $H_3BO_3$  is greater than for any  $\alpha$ -HO acid except possibly dihydroxymaleic acid. The velocity of the opening of the lactone ring increases with increasing cond., i. e., with increasing  $H^+$  ion concn. It could not be detd. whether the lactone itself has a positive influence on the cond. of  $H_3BO_3$  or not.

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The influence of boric acid on the conductivity of some optically active  $\alpha$ -hydroxy acids and on their racemates. J. BÖSEKEN AND L. A. VAN DER ENT. Delft. *Rec. trav. chim.* 37, 178-83(1918).—For these expts. *d*- and *dl*-mandelic acid and *d*- and *dl*-tartaric acid were used. The mandelic acid (a) was obtained by the action of KCN on the bisulfite of  $BzH$ . The CN deriv. was hydrolyzed with HCl (*Chem. Ztg.* 90, (1896)). Part of (a) was half neutralized with cinchonine by which the *d*-deriv. was sepd. in some days (*Ber.* 16, 1773(1883); 32, 2388(1899)). The free *d*-acid was liberated in the usual way and purified by crystg. from  $C_6H_6$ . The cond. was detd. as in previous papers (*C. A.* 6, 623; 9, 1766; 10, 1856; 11, 38, 2895). Although the data for *d*- and *dl*-mandelic acid in  $H_3BO_3$  soln. show some difference, it is concluded that the effect on the cond. of  $H_3BO_3$  is equal. The same was found true for *d*- and *dl*-tartaric acid. The effect of (a) is very much greater than that of tartaric acid, which cannot yet be fully explained. It is concluded that the influence of a racemic acid on the elec. cond. of  $H_3BO_3$  is equal to that of its active components.

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The salts of the complex acid, pyrocatechol-boric acid. J. BÖSEKEN with A. OBREIN AND MISS A. VAN HAEFTEN. Delft. *Rec. trav. chim.* 37, 184-94(1918).—B.'s expts. on the influence of various substances on  $H_3BO_3$  have shown that the increase in cond. is caused by an increase in the number of  $H^+$  ions. It is probable



that a complex of these compds. with  $H_2BO_3$  is formed. The behavior of mixts. shows that the complex acids are partly dissociated. Attempts to isolate them in the presence of  $H_2O$  have been fruitless. 2 other ways of obtaining them are available: (1) To allow the  $H_2BO_3$  to react on the poly-HO compd. in non-aq. solns.; (2) to attempt to obtain salts difficultly sol. in  $H_2O$ . In these expts. the 2nd way was used in isolating the  $NH_4$ , K, Rb,  $PhNH_2$ ,  $p\text{-}ClC_6H_4NH_2$  and  $PhNMe_2$  salts of pyrocatechol-boric acid. Analyses show that the compounds are quite complex, ranging with the aluminous and ferripyrocatechol acids (Weinland and Denzel, *C. A.* 8, 1767; Weinland and Binder, *C. A.* 6, 2435). The K,  $NH_4$  and Rb salts are obtained easily when concd. solns. of the 3 compds. are mixed in the proportion of  $H_2BO_3 : C_6H_4(OH)_2 : K((NH_4, Rb)\text{-}OH) = 1:2:1$ . The 3 salts cryst. as white leaves with a silvery luster. The  $NH_4$  complex sublimes without decompn. The complex salts of the organic bases were obtained by mixing concd. solns. of  $H_2BO_3$  (1 part) +  $C_6H_4(OH)_2$  (2 parts) with 1 part of liquid amine. The amines dissolve slowly and the salts later sep. as needles. Only B was difficult to det. analytically. The salt was destroyed in sealed Carius tubes with fuming  $HNO_3$ , the contents were neutralized with a known amt., in excess, of  $CaO$ , the soln. was evapd. and the residue heated to red heat in the electric furnace. The data are given in detail. The results for the  $NH_4$  salt agree with the empirical formula  $(C_6H_4O_2)_2B_2O_4(NH_4)_4$ . For the K salt the result is  $(C_6H_4O_2)_2B_2O_4K_2$  or  $(C_6H_4O_2)_2BO_4H_2K_2$ . For the Rb salt the analytical data point to  $(C_6H_4O_2)_2B_2O_4Rb_2$ . With  $PhNH_2$  the results were not quite certain but appear to conform with  $(C_6H_4O_2)_2B_2O_4(PhNH_2)_2$ . With  $PhNMe_2$  the results conform with  $(C_6H_4O_2)_2BH_2(C_6H_4NMe_2)_2 \cdot 5H_2O$ . With  $p\text{-}ClC_6H_4NH_2$  the formula  $(C_6H_4O_2)_2B_2O_4(ClC_6H_4NH_2)_4 \cdot 4H_2O$  conforms with the analytical results.

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The three trichlorobenzenes and their reaction with sodium methylate. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 37, 195-204 (1918).—In his study of the action of  $MeONa$  on the nitrodichlorobenzenes de Mooy also studied its action on dichlorobenzenes. He found that  $m\text{-}C_6H_4Cl_2$  is attacked most easily and gives, as do both the others,  $ClC_6H_4OH$ . These expts. have now been extended to the trichlorobenzenes. 1,2,3- $C_6H_3Cl_3$  (a) was prepd. from  $p\text{-}O_2NC_6H_4NH_2$ . 138 g. of the latter were chlorinated (*Rec. trav. chim.* 23, 366 (1904)) by dissolving in 2 l. com.  $HCl$  and adding 82 g.  $KClO_3$ . This soln. was treated at once with  $NaNO_2$ . A mixt. of 170.6 g.  $CuCl_2 \cdot 2H_2O$  in  $H_2O$  with 100 cc.  $HCl$  and 40 g.  $Cu$  powder was boiled until decolorized and added to the diazotized soln. The mixt. was steam distd. and gave considerable (about 136 g.) 1,2,3,5- $C_6H_2Cl_3NO_2$  (b). (b) was reduced as usual with  $Fe$  powder and  $HCl$ ; for 136 g. batches a granite boiler with mechanical stirrer was used. Several hrs. were required after which the soln. was alkalized and distd., giving the corresponding aniline (c). Two ways of converting (c) into (a) were tried. (c) was converted into its corresponding hydrazine and this compd. decompd. with Fehling soln. 98 g. (c) in 250 cc.  $HCl$  were treated with 43 g.  $NaNO_2$  and then with 250 g.  $SnCl_2 \cdot 2H_2O$  in 1 l.  $H_2O$ . The  $PhNHNH_2 \cdot HCl$  formed sepd. in part. The whole mass was then poured into 7.5 l. Fehling soln. and enough alkali added to keep the liquid alk. By steam distn. a poor yield of (a) was obtained. After 2 distns. under reduced pressure the product was white and m.  $52^\circ$ , but turned brown on standing. A stable product was obtained by agitating the ligroin soln. with concd.  $H_2SO_4$ . 1,3,4- $C_6H_3Cl_3$  (d) was obtained according to v. d. Linden (*Rec. trav. chim.* 23, 366 (1904)). In prepg. 1,3,5- $C_6H_3Cl_3$  (e) in order to convert 2,6,4- $Cl_3(O_2N)C_6H_2NH_2$  into 2,6,4- $C_6H_3Cl_3NO_2$  (f) the de Witt diazotization in concd.  $HNO_3$  was used (*Rec. trav. chim.* 23, 366 (1904)). The reduction of (f) was done more easily and the product diazotized gave (e). 100 g. of the aniline in 600 cc. com.  $HCl$  were treated slowly with a concd. soln. of 50 g.  $NaNO_2$ . 110 g.  $CuCl_2$  in 600 cc.  $HCl$  + 54 g. powdered  $Cu$  were heated

until decolorized and added to the cold diazo soln. 65 g. (e) (m.  $63^{\circ}$ ) were sepd. by steam distn. 5.44 g. (a) were heated 7 hrs. at  $180^{\circ}$  with 36 cc. of 0.85 *N* NaOMe. In a 2nd expt. 2 cc.  $H_2O$  were added. On opening the tubes there was no pressure and the contents were still alk. On distg., besides MeOH, a colorless oil was obtained which was dissolved in petr. ether and washed carefully with dil. KOH. The oil was then distd. *in vacuo* and gave white crystals. The residue was treated with steam, acidified and again treated with steam. From the aq. distillate a mixt. of much  $HOC_6H_4Cl_2$  (g) and some dichloroanisole was obtained by extg. Further work on this reaction will be published later by de Lange. On cooling (g), m.  $34-37^{\circ}$ , seps. 2,3- and 2,6- $Cl_2C_6H_3OH$  could be formed from (a). The latter was prepd. according to Chandon (Ber. 16, 1752(1883)) and m.  $65^{\circ}$ . The former, previously unknown, was prepd. by diazotizing 2,3- $Cl_2C_6H_3NH_2$  (C. A. 12, 1542) and m.  $37^{\circ}$ . The product obtained above was a mixt. of these 2 phenols as was shown by sepg. them. Of the 2 the 2,6-deriv. was most acid and was sepd. by partial extn. with a  $Na_2CO_3$  soln. The identification and sepn. of the 2 isomeric anisoles is also described. 5.44 g. (d) were heated 8 hrs. at  $180^{\circ}$  with 30 cc. *N* MeONa. In this case mainly 2,5- $Cl_2C_6H_3OH$ , m.  $57^{\circ}$ , was formed, and only a very small amt. of the anisole. 5 g. (e) heated with 36 cc. 0.85 *N* MeONa for 7 hrs. at  $180^{\circ}$  gave 3.7 g. *sym*- $Cl_2C_6H_3OMe$  as the main product, as well as some phenol. The anisole was identified by hydrolyzing in concd. HCl and sepg. the *sym*- $HOC_6H_3Cl_2$ , m.  $65^{\circ}$ . In order to measure the velocity of reaction of (a), (d) and (e) with NaOMe, 0.9075 g. was heated with 10 cc. 0.5 *N* NaOMe. Similar expts. with  $C_6H_4Cl_2$  isomers required 0.7350 g. for the same amt. of NaOMe. The tubes were heated at  $173-5^{\circ}$  for 3 hrs. Titrations of the Cl showed the following: With *o*- $C_6H_4Cl_2$  0.64% Cl; with the *m*-deriv. 1.66%; with the *p*-deriv. 0.04%; with (a) 27.6%; with (d) 27.7%; with (e) 57.4%. The velocity of reaction of the  $C_6H_4Cl_2$  isomers with NaOMe is many times greater than that of the  $C_6H_3Cl_2$  isomers, or, in other words, the introduction of a 3rd Cl atom causes a great increase in mobility of the atoms

E. J. WITZEMANN.

**The mechanism of the formation of benzophenone according to Friedel and Crafts.** S. C. J. OLIVIER. Wageningen. *Rec. trav. chim.* 37, 205-40(1918).—In previous papers O. (C. A. 8, 3013; 9, 442; 10, 1635, 1854) has made dynamic studies of the formation of various aromatic sulfones in  $C_6H_6$  soln. In the last study referred to abnormalities were found. O. has now studied an analogous reaction in order to extend information on the subject. The following reactions were studied: (1) action of  $BzCl$  on  $C_6H_6$  in presence of  $AlCl_3$  in  $C_6H_6$  soln.; (2) action of  $BzBr$  on  $C_6H_6$  under the influence of  $AlBr_3$  in  $C_6H_6$  soln.; (3) reaction (2) in  $CS_2$  soln. **Reaction 1:** The similar reaction of  $BzCl$  on  $PhMe$  in the presence of  $AlCl_3$  was studied by Steele (*J. Chem. Soc.* 83, 1470) but O. states that the analytical methods used were inexact and the conclusions are to be taken with caution. A careful study of the action of  $BzCl$  on  $C_6H_6$  in presence of  $AlCl_3$  in  $C_6H_6$  soln. seemed justified. The  $AlCl_3$  was prepd. as usual (C. A. 8, 3013). The  $C_6H_6$  used was Merck's thiophene-free product which was dried with  $CaCl_2$ , then Na and fractionated. The  $BzCl$  was specially purified by fractional crystn. All these materials were kept in glass-stoppered bottles in a  $H_2SO_4$  desiccator. The progress of the reaction was measured by detg. the unchanged  $BzCl$  as follows: a known portion of the  $C_6H_6$  soln. containing the reaction products was pipetted off and dropped into 50 cc. dil. alkali containing 3 g. KOH and enough KOH to convert the  $AlCl_3$  present into  $Al(OK)_3$ . This was boiled 1 hr. under a condenser. The  $C_6H_6$  was then removed by heating the acidified soln. The soln. was then extd. with  $Et_2O$  and each ext. washed carefully with  $H_2O$ . The wash  $H_2O$  was returned and extn. continued. The  $Et_2O$  layers were united, evapd., dissolved in 50 cc. 95%  $EtOH$  and the  $BzOH$  was titrated, using phenolphthalein as indicator. Blank expts. showed the results to be satisfac-

tory. The velocity of reaction was detd. as follows: a weighed amt. of powdered  $\text{AlCl}_3$  was placed in a small flask with the  $\text{BzCl}$ . The mol. complex  $\text{BzCl} \cdot \text{AlCl}_3$  (Böese-ken, *Rec. trav. chim.* 19, 19) is formed with the evolution of heat. The requisite amt. of  $\text{C}_6\text{H}_6$  was then added and brought into soln. by agitation in a closed flask. A stopper containing a tube connected with a  $\text{H}_2\text{SO}_4$  wash bottle was fitted to the flask and the latter placed in a thermostat at  $30^\circ$ . After about 10 mins. the 1st sample was taken from the flask and this was used as the beginning of the run. In order to avoid weighing exact amts. of 2 hygroscopic compds. a small excess of  $\text{BzCl}$  was used but the velocity const. was calcd. on the basis of the  $\text{AlCl}_3 \cdot \text{BzCl}$  complex formed, because  $\text{BzPh} \cdot \text{AlCl}_3$  does not give up  $\text{AlCl}_3$  to  $\text{BzCl}$  as was shown by the results. The results show that the reaction is monomol. although there is a slight regular fall in the values. The data for different concns. of  $\text{AlCl}_3$  (0.1 and 0.2 mol.) show that  $K_{0.2}/K_{0.1} = \approx 1.30$ . When excess  $\text{BzCl}$  was used const. for the velocity could be obtained only on the basis of  $\text{AlCl}_3$  present. The excess of  $\text{BzCl}$  was without influence. A  $\text{C}_6\text{H}_6$  soln. of  $\text{BzPh} \cdot \text{AlCl}_3$  (0.2 mol.) was satd. with dry  $\text{HCl}$  gas and kept at  $30^\circ$  for 5 days. On analysis no trace of  $\text{BzCl}$  was found, showing that the reaction  $\text{BzCl} \cdot \text{AlCl}_3 + \text{C}_6\text{H}_6 \rightleftharpoons \text{BzPh} \cdot \text{AlCl}_3 + \text{HCl}$  is not sensibly reversible. The results agree with what was previously found with the aromatic sulfones except in the ratio of  $K_{0.2}/K_{0.1}$ . This might be due to the following dissociation:  $\text{BzCl} \cdot \text{AlCl}_3 \rightleftharpoons \text{BzCl} + \text{AlCl}_3$ . Special expts. in which 1 mol.  $\text{AlCl}_3 + 1$  mol.  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl} + 1$  mol.  $\text{BzCl}$  were dissolved in  $\text{C}_6\text{H}_6$  and treated as above showed about the same velocity const. as though the  $m\text{-O}_2\text{N} \cdot \text{C}_6\text{H}_4\text{SO}_2\text{Cl}$  were not present. Since  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl}$  would diminish the concn. of dissociated  $\text{AlCl}_3$ , the const. should be smaller if this dissociation really exists. The reaction products showed much  $\text{BzPh}$  and traces of *m*-nitrodiphenylsulfone. This relation confirms a former observation (C. A. 10, 1635) that  $\text{AlCl}_3$  combines most easily with the acid chloride, which as the addition complex reacts most rapidly with  $\text{C}_6\text{H}_6$  (at  $30^\circ$  for  $\text{BzCl}$   $K_{0.1} = 0.00230$ ; for  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl}$   $K_{0.1} = 0.000136$ ). In order to study this further the influence of concn. of an excess of the catalyst was studied. For this purpose  $\text{AlBr}_3$  was better suited because of its greater soly. in  $\text{C}_6\text{H}_6$ .

**Reaction II: Action of  $\text{BzBr}$  on  $\text{C}_6\text{H}_6$  in presence of  $\text{AlBr}_3$  in  $\text{C}_6\text{H}_6$  soln.**  $\text{BzBr} \cdot \text{AlBr}_3$  is obtained with the liberation of heat on mixing the components. It is obtained in the pure form as yellow hygroscopic crystals from  $\text{CS}_2$  soln. The velocity of reaction in these expts. was detd. as above since the unchanged  $\text{BzBr}$  could be detd. as  $\text{BzCl}$  was. In a 1st series of expts. it was shown that the velocity of reaction of prepd.  $\text{BzBr} \cdot \text{AlBr}_3$  and mixts. of  $\text{BzBr}$  and  $\text{AlBr}_3$  in  $\text{C}_6\text{H}_6$  is the same. As with  $\text{BzCl}$  the reaction is monomol., showing a slight steady fall in the const. Likewise the ratio  $K_{0.2}/K_{0.1}$  is 1.31 instead of 2 as was found for the sulfone. The velocity of reaction with  $\text{BzBr}$  is considerably greater than with  $\text{BzCl}$ . A series on the effect of temp. showed the ratio  $K_{0.2}/K_{0.1}$  practically unchanged. The temp. coeff. at 0.1 mol.  $\text{AlBr}_3$  was 2.51 for  $40\text{--}30^\circ$ , 2.80 for  $30\text{--}20^\circ$ , 2.91 for  $20\text{--}10^\circ$ , and at 0.2 mol.  $\text{AlBr}_3$  were 2.32, 2.62 and 3.12, resp. These values are normal. Diffuse sunlight was without influence on the velocity of reaction. Excess  $\text{BzBr}$  was without perceptible influence on the velocity of the reaction. The  $\text{AlBr}_3$  mol. transforms but 1 mol.  $\text{BzBr}$  into  $\text{BzPh}$ . The velocity of reaction increases with the concn. of  $\text{BzBr} \cdot \text{AlBr}_3$  but the increase in  $K$  does not keep pace with the concn. proportionally. An excess of  $\text{AlBr}_3$  gives rise to an enormous increase in the velocity of reaction and the excess then acts proportionally to its concn. This might make it appear that of the combined and free  $\text{AlBr}_3$ , the latter is most active. Expts. from which the ratio  $K_{0.2} + K'/K_{0.1} + K'$  was detd., in which  $K'$  was a definite excess of  $\text{AlBr}_3$ , gave the same ratio 1.34 as usual, thus showing that the excess  $\text{AlBr}_3$  has no additional catalytic effect. It appears that the increased velocity of reaction of more concd. solns. of  $\text{BzBr} \cdot \text{AlBr}_3$  may be due to a different degree of association of  $\text{BzBr} \cdot \text{AlBr}_3$ . Cryoscopic measurements on  $\text{BzPh} \cdot \text{AlBr}_3$  in  $\text{C}_6\text{H}_6$  soln. show that it

forms associated mols. easily in which often more than 2 mols. of  $\text{AlBr}_3$  are present.  $\text{BzBr} \cdot \text{AlBr}_3$  probably acts similarly (cf. below). Excess  $\text{AlBr}_3$  combines easily with  $\text{BzPh} \cdot \text{AlBr}_3$  when there is no free  $\text{BzBr}$ . O. suggests that the associated mols.  $(\text{BzBr} \cdot \text{AlBr}_3)_n$  are more active as reacting mols. than less associated or unassociated ones. From this point of view it is not the  $\text{AlBr}_3$  combined with  $\text{C}_6\text{H}_6$  that causes the larger velocity const. in the more concd. solns. This interpretation also explains the gradual diminution in the const. during the course of the reaction. Excess  $\text{BzBr}$  does not combine easily with the  $\text{AlBr}_3$  addition products and so does not influence the reaction. The same interpretation may be used for the chlorides. *Reaction III: The action of  $\text{BaBr}$  on  $\text{C}_6\text{H}_6$  in the presence of  $\text{AlBr}_3$  in  $\text{CS}_2$  soln.:* These expts. were carried out as nearly as possible as before except that the flasks were closed with corks covered with collodion. The  $\text{CS}_2$  used was agitated for some hrs. with  $\text{Hg}$ ,  $\text{HgCl}_2$ ,  $\text{KMnO}_4$  and  $\text{CaCl}_2$  and fractionated. Owing to the  $\text{CS}_2$  the unchanged  $\text{BzBr}$  was detd. by heating 3 hrs. with 40 cc. 12%  $\text{H}_2\text{SO}_4$ , the  $\text{CS}_2$  was evapd., the mixt. was then boiled again for 1 hr. and titrated. The data show that the reaction under these condition ought to be considered to be bimol. In  $\text{CS}_2$  soln. the velocity const. increases with increasing concn. of  $\text{BzBr} \cdot \text{AlBr}_3$ . Moreover, as in  $\text{C}_6\text{H}_6$  soln., an excess of  $\text{AlBr}_3$  causes an enormous increase in the velocity const. Ebullioscopic detns. in  $\text{CS}_2$  soln. showed that  $\text{AlBr}_3$  forms associated mols. but the association does not increase rapidly with the concn. O. suggests that this may be due to the fact that the  $\text{CS}_2$  combines with the  $\text{AlBr}_3$  to give unstable compds. In increasing the concn. the lowering of the b. p. caused by increased association ought to be compensated then by an elevation of the b. p. following the combination of the solvent with the solute. From this point of view the mechanism of the reaction in  $\text{CS}_2$  becomes very complicated. Additional expts. are described from which it is concluded that the amt. of free  $\text{AlBr}_3$  does not det. the velocity of the reaction although excess  $\text{AlBr}_3$  does enormously influence it. O. found that the presence of  $\text{C}_6\text{H}_6$  causes an increase in the association of the  $\text{AlBr}_3$  complex in  $\text{CS}_2$  soln.

E. J. WITZEMANN.

**A reaction of nitrated aromatic compounds.** S. C. J. OLIVIER. Wageningen. *Rec. trav. chim.* 37, 241-4 (1918).—In a preceding paper O. stated that  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl} \cdot \text{AlCl}_3$ , although a colorless compd., gives an intense orange-red color in  $\text{C}_6\text{H}_6$  soln. (C. A. 10, 1635). On adding  $\text{H}_2\text{O}$  the addition compd. is decompd. and the color disappears. It seemed that nitrated aromatic compds. in general showed this red color when made as follows: The compd. is dissolved in  $\text{C}_6\text{H}_6$  and anhydrous  $\text{AlBr}_3$  is added. That the test is not due to free Br is indicated by the disappearance of the red color on adding  $\text{H}_2\text{O}$ . Further tests showed that all of the following gave the reaction:  $\text{PhNO}_2$ ,  $p\text{-O}_2\text{NC}_6\text{H}_4\text{CONH}_2$ ,  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ ,  $o$ - and  $m\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ , as well as the Ba salts,  $m$ -nitrodiphenylsulfone,  $o\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$ ,  $m\text{-C}_6\text{H}_4(\text{NO}_2)_2$  and picric acid: With  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl}$  it was necessary to use  $\text{AlCl}_3$  instead of  $\text{AlBr}_3$  because of the liberation of Br. After a time nearly colorless crystals sep. and this is accompanied by partial decolorization. In certain cases it is necessary to add excess  $\text{AlBr}_3$  to get the test. The 1st mol.  $\text{AlBr}_3$  combines with the  $\text{SO}_2$  group of the sulfones and the 2nd mol. only is available for the  $\text{NO}_2$  group. This would give rise to 2 products thus:  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Ph}$  (colorless) and  $m\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl}$  (colored). For all the  $o$ -mono-

$\text{AlCl}_3$

$\text{AlCl}_3$

$\text{NO}_2$  compds. examd. it is necessary to use a small amt. of  $\text{AlBr}_3$  in order to obtain the orange-red color. If more is used, e. g., with  $o\text{-C}_6\text{H}_4(\text{NO}_2)_2$ , the soln. becomes brown or black and colored products are obtained on adding  $\text{H}_2\text{O}$ . The reaction is not obtained so characteristically with nitroaliphatic compds. (nitroguanidine). The  $\text{C}_6\text{H}_6$  plays an essential role in the reaction.  $\text{CS}_2$  could not be used for  $\text{C}_6\text{H}_6$  in most cases.

E. J. WITZEMANN.

**The formation and the decomposition of some halogenated organic compounds.**

EINAR BRILMANN. Univ. Copenhagen. *Rec. trav. chim.* 37, 245-50(1918).—In a preceding paper (*C. A.* 11, 3037) it was demonstrated that the reduction of dibromopropionic acid into acrylic acid by the action of KI in H<sub>2</sub>O takes place as follows:  $\text{CH}_2\text{BrCHBrCO}_2\text{H} + 3\text{KI} \longrightarrow \text{CH}_2\text{:CHCO}_2\text{H} + 2\text{KBr} + \text{KI}_2$ . The KI<sub>2</sub> does not react with the acrylic acid. The reaction gave good consts. for a bimol. reaction, when the free I<sub>2</sub> at various stages was titrated with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. 0.1 mol. dibromopropionic acid + 0.3 mol. KI per l. were dissolved in 1.0 N H<sub>2</sub>SO<sub>4</sub> and the rate of formation of I at 53° detd. The results calcd. on the bimol. formula gave  $K_{25} = 0.0711$ . The const. previously detd. at 25° was  $K_{25} = 0.0220$ . The temp. coeff. for this reaction 0.0711/0.0220 is therefore 3.23. Expts were made with dibromosuccinic acid (a) on the supposition that the reaction would be  $(\text{CHBr.CO}_2\text{H})_2 + 3\text{KI} \longrightarrow (\text{:CHCO}_2\text{H})_2 + 2\text{KBr} + \text{KI}_2$ . A more dil. soln. of (a) was used because of its smaller soly. The velocity const. by the bimol. formula ( $1/40$  mol. (a) +  $1/40$  mol. KI per l. in 1.0 N H<sub>2</sub>SO<sub>4</sub>) at 25° is  $K_{25} = 0.0143$ . At 35°  $K = 0.0388$ . The temp. coeff. of this reaction is accordingly 2.69. A comparison of the behavior of (a) and isodibromosuccinic acid (b) was of interest. B. found that the reaction of (b) with KI is slow while the hydrolysis with the formation of HBr is fast so that const. values for K could not be obtained as with (a). These results coincide with those of Holmberg (*C. A.* 6, 74) with K xanthogenate. The product with both (a) and (b) is fumaric acid. Benzylbromomalononic acid reacts thus:  $\text{PhCH}_2\text{CBr}(\text{CO}_2\text{H})_2 + 3\text{KI} + \text{H}_2\text{O} \longrightarrow \text{PhCH}_2\text{CH}(\text{CO}_2\text{H})_2 + \text{KI}_2 + \text{KBr} + \text{KOH}$ , and may be followed by titrating I or KOH. The velocity const. could not be detd.

E. J. WITZEMANN.

**The nonformation of an *o*-tolylhydrazone of lactose, an affirmation of its molecular structure and its indirect identification.** A. W. VAN DER HAAR. Utrecht. *Rec. trav. chim.* 37, 251-3(1918).—In a preceding paper *o*-tolylhydrazine (*C. A.* 12, 1543) was described as a specific reagent for *d*-galactose. Only *d*-galactose gives a cryst. colorless hydrazone, while *l*-arabinose, xylose, rhamnose, fucose, *d*-glucose, *d*-mannose and *d*-fructose do not do so. It therefore seemed important to study the behavior of *o*-tolylhydrazine with di- and trisaccharides. Non-reducing disaccharides like sucrose and trehalose which lack the partial configuration of *d*-galactose as well as the free CO group do not give *o*-tolylhydrazones. Raffinose, although it contains the partial configuration has no free CO group and does not give an *o*-tolylhydrazone. Maltose, although a reducing sugar having a free CO group but not the partial configuration of galactose, does not form the *o*-tolylhydrazone. Lactose containing the galactose configuration and the free CO group of a reducing sugar also fails to give an *o*-tolylhydrazone. From this v. d. H. concludes that the free CO group of the *d*-galactose configuration is fixed while only that with *d*-glucose configuration functions in lactose. This confirms the mol. structure assigned to lactose by Fischer (*Ber.* 26, 2400(1893)). *d*-Galactose mixed with lactose was easily detected with *o*-tolylhydrazine. 0.400 g. lactose were hydrolyzed in 10 cc. 2% H<sub>2</sub>SO<sub>4</sub>. The soln. was neutralized with excess BaCO<sub>3</sub>, the liquid filtered, evapd. to a sirup and mixed with an equal amt. of H<sub>2</sub>O and 5 cc. 95% EtOH. After heating 0.5 hr. on the water bath with 0.400 g. *o*-tolylhydrazine 0.030 g. of the *d*-galactose *o*-tolylhydrazone sepd. after 48 hrs. In this indirect way lactose may be distinguished from the other polysaccharides that do not contain the *d*-galactose group.

E. J. WITZEMANN.

**Direct rupture of the benzene ring without degradation.** II. H. PAULY AND G. WILL. *Ann.* 416, 1-20(1918); *J. Chem. Soc.* 114, I, 525-6; cf. Pauly, Gilmore and Will (*C. A.* 8, 1736).—P. and W. have already shown that when 3-nitro-*p*-cresol is warmed with concd. H<sub>2</sub>SO<sub>4</sub>, NH<sub>2</sub>OH and β-methyl-γ-crotonolactone-γ-acetic acid (a),

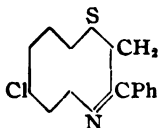
$\text{O.CO.CH:CMc.CHCH}_2\text{CO}_2\text{H}$ , are formed, and they have suggested the immediate precursor of the lactonic acid is  $\beta$ -methylmuconic acid (*b*),  $\text{HO}_2\text{CCH:CHCMc:CHCO}_2\text{H}$ . It is now shown that the latter acid can be prepd. from the lactone and easily reconverted into it. The optimum temp. for the above hydrolytic rupture is  $111-3^\circ$ . The nitrogenous acid by-product reacts very slowly with  $\text{MeOH-HCl}$  compared with the lactonic acid and a sepn. of the acids is best effected by taking advantage of this fact. The Me ester of the lactonic acid (now called *isoprenelactonic* or  $\beta$ -methylmuconolactonic acid), *b*,  $310^\circ$ , and is hydrolyzed by treatment with  $\text{MeONa}$  to methyl hydrogen  $\beta$ -methylmuconate (*isoprenedicarboxylate*), which forms needles, *m.*  $125^\circ$ . This is converted into the free acid (*b*), *m.*  $171^\circ$ , by hydrolysis with  $\text{NaOH}$ , and into the di-Me ester, long, glistening needles, *b*,  $142-143^\circ$ , *m.*  $38.5^\circ$ , by means of  $\text{Me}_2\text{SO}_4$ . The acid resembles muconic acid in forming very sparingly soluble barium, silver and lead salts, and the methyl ester, like isoprene, changes in the course of time into a pale, elastic polymeride. The corresponding diamide, *m.*  $213-4^\circ$ , and becomes deep bluish green when kept molten for a few minutes; methyl  $\beta$ -methyl muconamate forms stout prisms, *m.*  $161-2^\circ$ , and the vapors obtained by heating it with  $\text{Zn}$  dust give the pyrrole reactions. The reconversion of the di- $\text{CO}_2\text{H}$  acid into the lactonic acid can be effected by means of warm  $\text{H}_2\text{SO}_4$ , glacial  $\text{AcOH}$  solns. of  $\text{HCl}$  or  $\text{HBr}$ , or by melting. Similarly, the above Me H ester yields the Me ester of the lactonic acid when heated at  $210^\circ$ . The di- $\text{CO}_2\text{H}$  acid is most readily reduced by  $\text{Na-Hg}$ , the product being  $\beta$ -methyl- $\Delta^{\beta}$ -butene- $\alpha,\delta$ -dicarboxylic acid,  $\text{HO}_2\text{C.CH}_2\text{CMc:CHCH}_2\text{CO}_2\text{H}$ . This was prepd. previously from the lactonic acid and designated  $\beta$ -methylidihydromuconic acid, but the position of the ethylene linking remained to be proved. The acid, *m.*  $140-1^\circ$ , couples with diazonium salts, which, from analogy to glutamic acid, shows that the double bond is in the middle of the chain. The methyl ester is a limpid liquid with the odor of melons, *b*,  $245^\circ$ ,  $d_{20}^{20}$  1.0824, and yields  $\text{AcCH}_2\text{CO}_2\text{Me}$  when its ozonide is boiled with  $\text{H}_2\text{O}$ , this fact also attesting to the position of the ethylene linking. The free (*b*) reacts vigorously with  $\text{Br}$ ,  $\text{HBr}$  being evolved, but its Me ester absorbs 4 atoms of  $\text{Br}$  fairly readily. The above butenedicarboxylic acid also absorbs  $\text{Br}$  at  $40-50^\circ$ , giving  $\beta,\gamma$ -dibromo- $\beta$ -methyladipic acid,  $\text{HO}_2\text{C.CH}_2\text{CMcBrCHBrCH}_2\text{CO}_2\text{H}$ , *m.*  $166^\circ$ , which is decompd. by boiling  $\text{EtOH-KOH}$ , the products including isoprene and (*b*).

C. J. WEGST

**Naphthasultam.** III. Nitro and amino derivatives of naphthasultam and hydrolytic products of tetrachloroketotetrahydronaphthasultam (2,2,3,3-tetrachloro-1,8-naphthasultam-4-quinone). TH. ZINCKE AND GRETE SCHÜRMANN. *Ann.* 416, 65-85 (1918); *J. Chem. Soc.* 114, I, 550-1; cf. *C. A.* 11, 1403. The analogy between 1,8-naphthasultam and  $\alpha$ - $\text{C}_{10}\text{H}_7\text{OH}$  is also exhibited by their  $\text{O}_2\text{N-}$  and  $\text{H}_2\text{N-}$ derivs. When 1,8-naphthasultam is ground with  $\text{HNO}_3$  (d. 1.2; 10 parts) it yields 2,4-dinitro-1,8-naphthasultam,  $\text{C}_{10}\text{H}_5\text{O}_4\text{N}_2\text{S}$ , in brownish yellow tablets and prisms, *m.*  $258^\circ$  (decompn.) and forms deep yellow cryst. ammonium, potassium and sodium salts. Dannerth (*J. Am. Chem. Soc.* 29, 1319) regarded the product as a mono- $\text{NO}_2$  deriv. On reduction with  $\text{Sn}$  and  $\text{HCl}$  the compd. gives 2,4-diamino-1,8-naphthasultam, slender, yellow needles, which soon become dark on exposure to the air; monohydrochloride, yellow needles; dihydrochloride, pale yellow needles; triacetate, needles, *m.* above  $270^\circ$ , which changes into 2,4-diacylamino-1,8-naphthasultam,  $\text{C}_{14}\text{H}_{15}\text{O}_4\text{N}_2\text{S}$ , when shaken with dil. alkali hydroxides. The  $\text{HCl}$  salts are oxidized by  $\text{FeCl}_3$  to 2-amino-1,8-naphthasultam-4-quinoneimide (I), a reddish brown powder, which darkens at  $230-5^\circ$ , and forms a hydrochloride, dark red needles. The imide reacts with  $\text{PhNH}_2$  in hot alc.  $\text{AcOH}$  to give 2-anilino-1,8-naphthasultamquinoneanil,  $\text{C}_{22}\text{H}_{19}\text{O}_4\text{N}_3\text{S}$ , which crystals in bronzy red needles, *m.*  $235-6^\circ$  and forms an almost black hydrochloride and nitrate. 2,2,3,3-Tetrachloronaphthaquinone and 2,3,2,3-tetrachloro-1,8-naphthasultam-4-quinone re-



$\text{H}_2\text{S}$ )<sub>2</sub>O in its reactions. Esters of the sulfinous acid,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSOR}$ , are obtained by the action of alc. or  $\text{Et}_2\text{O}$  solns. of the Na alkyl or aryl oxides; *methyl ester*, golden leaflets, m.  $111-2^\circ$ ; *ethyl ester*, yellow needles, m.  $73-4^\circ$ ; *phenyl ester*, nodules of stout, yellow needles, m.  $75^\circ$ . *4-Chloro-2-nitrobenzenesulfinic acid*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSO}_2\text{H}$ , slender, glistening leaflets, m.  $127^\circ$  (decompn.), is prepd. by shaking the chlorothiols with 2 N NaOH and acidifying the filtrate. Its Ag salt reacts with MeI to form the *methyl ester*, m.  $143^\circ$ , and with the chlorothiol, to give *4,4'-dichloro-2,2'-dinitrodiphenyl disulfide*,  $\text{S}_2\text{O}_2(\text{C}_6\text{H}_3\text{ClNO}_2)_2$ , needles, m.  $145^\circ$ . The chlorothiol reacts with  $\text{NH}_3$  in  $\text{CHCl}_3$  soln. to give *4-chloro-2-nitrophenylthiolamine*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSNH}_2$ , glistening, yellow leaflets, m.  $126-7^\circ$ , and resembles the corresponding *o*-compd. It forms a *benzylidene compound*, long, yellow needles, m.  $161^\circ$ , and when boiled with 50% AcOH, changes into *4,4'-dichloro-2,2'-dinitrodiphenyldithiolamine*,  $\text{NH}(\text{SC}_6\text{H}_3\text{ClNO}_2)_2$ , slender, pale yellow needles, m.  $210^\circ$  (decompn.). Towards phenols the chlorothiol behaves like a diazonium chloride; PhOH gives *4-chloro-2-nitro-4'-hydroxydiphenyl sulfide*, yellow needles, m.  $130^\circ$ ;  $\alpha\text{-C}_{10}\text{H}_7\text{OH}$  forms *4-chloro-2-nitrophenyl-2'- $\alpha$ -hydroxynaphthyl sulfide*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSC}_{10}\text{H}_6\text{OH}$ , small, yellow tablets, m.  $154-5^\circ$ ;  $\beta\text{-C}_{10}\text{H}_7\text{OH}$  yields a *sulfide*, which crysts. in orange-yellow needles, m.  $185^\circ$ . The thiol also condenses with ketones. AcMe yields *4-chloro-2-nitrophenylthioacetone*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSCH}_2\text{COMe}$ , yellow leaflets or broad needles, m.  $114-5^\circ$ ; BzMe gives *phenyl 4-chloro-2-nitrophenylthio-methyl ketone*, pale yellow needles, m.  $155^\circ$ , which is oxidized by  $\text{HNO}_3$  to BzH and  $\text{S}_2\text{O}_2(\text{C}_6\text{H}_3\text{ClNO}_2)_2$ .  $\text{AcCH}_3\text{CO}_2\text{Et}$  or its Cu compd. forms *ethyl 4-chloro-2-nitrophenylthioacetate*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSCHAcCO}_2\text{Et}$ , pale yellow tablets, m.  $129-30^\circ$ , decomp.  $170^\circ$ .  $\text{Ac}_2\text{CH}_2$  yields *diacetyl-4-chloro-2-nitrophenyldithiolmethane*,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSCHAc}_2$ , brilliant yellow, large needles, m.  $116-7^\circ$ . Upon oxidation these compds. yield sulf-oxides; the compound  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSOCH}_2\text{Bz}$  forms pale yellow needles, m.  $144^\circ$ , and the compound,  $\text{O}_2\text{NC}_6\text{H}_4\text{ClSOCHAcCO}_2\text{Et}$ , stout, yellow tablets, m.  $111^\circ$ . They may also be reduced by  $\text{SnCl}_2$ , but the products are thiazine derivs., and not amines. They sep. as chlorostannates. *6-Chloro-3-phenyl-1,4-benzothiazine*, crysts. in pale yellow,



glistening tablets, m.  $64^\circ$ , and forms orange or red salts with mineral acids, these being decompd. by  $\text{H}_2\text{O}$ . The thiazine changes in a few days into a mixt. of 2 compds., m.  $178^\circ$  and  $214^\circ$ ; the change also proceeds in soln., AcOH favoring the compd. with the higher m. p., and  $\text{CHCl}_3$  the other. The constitution is elucidated by the fact that the thiazine may be synthesized by the action of  $\text{C}_6\text{H}_5\text{COCH}_2\text{Br}$  on *4,2*-Cl( $\text{H}_2\text{N}$ )- $\text{C}_6\text{H}_3\text{SH}$ . *Ethyl 6-chloro-3-methyl-1,4-benzothiazine-2-carboxylate* crysts. in glistening, orange-red tablets or stout needles, m.  $177-8^\circ$ .  
C. J. WEST.

**Behavior of thymic acid to phenylhydrazine.** R. FEULGEN AND G. LANDMANN. *Z. physiol. Chem.* 102, 262-5 (1918); *J. Chem. Soc.* 114, I, 554-5.—Further evidence of the existence of 2 free CHO groups in thymic acid is furnished by the prepn. of a diphenylhydrazone of the acid, which is isolated in the form of its Ba salt. Ba thymate is dissolved in  $\text{H}_2\text{O}$  and treated at  $60^\circ$  with  $\text{PhNHNH}_2$  in AcOH. The temp. is then raised to  $100^\circ$ , and the heating continued for 20 min.  $\text{Ba}(\text{AcO})_2$  is added and then 3 vol. of boiling alc. After cooling, the pptd. phenylhydrazone is purified by repptn. by alc. from dil. AcOH. *Barium phenylhydrazinotymate*,  $\text{C}_{40}\text{O}_{38}\text{O}_{24}\text{N}_4\text{P}_2\text{Ba}_2$ , is a yellow, amorphous substance which readily decomp. when heated or treated with strong acids. Cryst. derivs. have not been obtained.  
C. J. WEST.



The hydrate and alcoholate of calcium benzoate. FREDRICK STANBRIDGE. *J. Chem. Soc.* 113, 808-16(1918).— $\text{Ca}(\text{OBz})_2 \cdot 3\text{H}_2\text{O}$  when completely dehydrated and then treated with alc., forms a *dialcoholate* of the formula  $\text{Ca}(\text{OBz})_2 \cdot 2\text{EtOH}$ . This salt is unstable. On the other hand, the trihydrate when treated with an excess of strong alc. is partially dehydrated and a *monohydrate*,  $\text{Ca}(\text{OBz})_2 \cdot \text{H}_2\text{O}$ , is formed. Soly. measurements of the trihydrate at a temp. range of  $0.2-85^\circ$  were made and these also point to the existence of a lower hydrate, probably the monohydrate. The transition temp. was found to be  $84.7^\circ$ , and the soly. 7.62 g. of  $\text{Ca}(\text{OBz})_2$  per 100 g. of  $\text{H}_2\text{O}$ . A study of the f. ps. of solns. of  $\text{Ca}(\text{OBz})_2$  showed that the cryohydric point is  $-0.37$  when the soln. contains 2.22 g. of  $\text{Ca}(\text{OBz})_2$  per 100 g. of  $\text{H}_2\text{O}$ . MAX PHILLIPS.

Hydrogenation of aromatic compounds with the aid of platinum. III. Hydrogenation with platinum containing oxygen. RICHARD WILLSTÄTTER AND DANIEL JAQUET. *Akad. Wiss. München. Ber.* 51, 767-79(1918); cf. *C. A.* 7, 1508.—Certain reductions, like that of phthalic anhydride (*a*), which cannot be effected catalytically with Pt free from O, can be initiated by loading the Pt with O and brought to completion by again treating the Pt with O as the catalyst gradually loses its O by the formation of  $\text{H}_2\text{O}$ . Oxygen-free Pt and that containing O behave like 2 different contact substances in reduction processes. Thus, 20.3 g. (*a*) in 75 cc. glacial AcOH with 5 g. Pt absorbed only 400 cc. H; if, however, the H gasometer was shut off and the reaction bulb evacuated, then allowed to fill with air, shaken 1 min. (whereupon O was rapidly absorbed—about 5 cc. per g. Pt) and the air was driven out with H, about 500 cc. of H was again absorbed after each such activation until the 20th and 21st times, when the absorption of H was 1230 and 5600 cc., resp. The total absorption was 17040 cc. ( $20^\circ$ , 760 mm.) or, deducting about 1150 cc. used up by the O introduced in the activations, 15890 cc. or 4.8 mols. Of the 2 rings in (*a*) the 5-membered one is reduced before the  $\text{C}_6\text{H}_4$  ring; the first product is phthalide (*b*) which is partially reduced to hexahydrophthalide (*c*) and partially to *o*- $\text{MeC}_6\text{H}_4\text{CO}_2\text{H}$  (*d*) which is then reduced to the hexahydrotoluic acid (*e*). If the process is interrupted when only a little H has been absorbed there is obtained, besides some  $\text{C}_6\text{H}_5(\text{CO}_2\text{H})_2$ , a mixt. of (*b*) and (*c*), and while (*b*) is easily reduced further to (*d*), (*c*) cannot be reduced to (*e*). If in the process of isolation alkali is employed the (*c*) is in part obtained as methylolhexahydrobenzoic acid. Among the reduction products is also *cis*-hexahydrophthalic acid (*f*). In the reduction described above were obtained 7 g. (*c*) (partially hydrolyzed), 7 g. (*e*) and 4 g. (*f*). In a similar reduction of (*b*) 3.4 mols. H were absorbed and there were obtained about equal parts of (*e*) and (*c*). Phthalimide behaves quite differently from (*a*) on reduction, the aromatic nucleus and not the CO groups taking up the O. The activation of the Pt with O is not necessary but the reduction is successful only with the best Pt sponge preps.; many which were active towards  $\text{C}_6\text{H}_6$  were inactive towards the imide. Nor can MeOH, EtOH or cyclohexane be used as a solvent; in glacial AcOH the reduction proceeds smoothly. *cis*-Hexahydrophthalimide seps. from  $\text{H}_2\text{O}$ , alc. and AcOH in monoclinic prisms, m.  $132^\circ$ . Naphthalic acid purified by crystn. from alc. cannot be reduced because it always contains some anhydride (*g*) but the acid freshly pptd. from alk. soln. can be reduced; contrary to  $\text{C}_{10}\text{H}_8$ , it takes up only 4 atoms of H; the tetrahydronaphthalic acid (*h*) seps. in cube-like prisms, m.  $196^\circ$  with loss of  $\text{H}_2\text{O}$  and conversion into the anhydride, m.  $119^\circ$ . (*g*), like (*a*), can be reduced only with Pt activated with O; after about 4 mols.  $\text{H}_2$  have been absorbed the reaction slows up. As far as the (*g*) itself is reduced, the anhydride ring is attacked, but as some of the (*g*) is hydrolyzed by the  $\text{H}_2\text{O}$  formed, some (*h*) is obtained. Among the reduction products are tetrahydro-1-methylnaphthalene-8-carboxylic acid (*i*), tetra- and decahydronaphthalides and a small amt. of decahydroacenaphthene. The 2 naphthalides could not be isolated pure. The (*i*) seps. from  $\text{Et}_2\text{O}$ -petr. ether in

needles, m.  $150^{\circ}$ .  $o$ - $C_6H_4(CO_2H)_2$  is easily reduced in AcOH when entirely free from the anhydride, yielding exclusively the *cis*-hexahydro acid, m.  $191-2^{\circ}$ . The *p*-acid in AcOH suspension is reduced much more rapidly on gentle warming, giving about equal parts of the *cis*- and *cis-trans*-hexahydro acids, m.  $162-3^{\circ}$  and about  $300^{\circ}$ , resp. The *m*-acid, if pure, is likewise easily reduced in AcOH suspension, forming chiefly the *cis*- and some *cis-trans*-hexahydro acid. *p*-Toluylic acid very quickly gives exclusively or almost exclusively the liquid hexahydro acid whose amide m.  $175-6^{\circ}$ . Indole in AcOH smoothly absorbs 8 atoms H with formation of *perhydroindole*, b<sub>m</sub>  $182-3^{\circ}$ , b<sub>11</sub>  $65^{\circ}$ , a basic oil of medium consistency and unpleasant, penetrating, onion-like odor,  $d_4^{20}$  0.9947; *chloroplatinate*, reddish yellow monoclinic tablets from alc., m.  $172-3^{\circ}$  (not sharply); *picrate*, fine needles from alc., m.  $137-8^{\circ}$  (not sharply). If the reduction is interrupted before it is complete (e. g., when 2 atoms of H have been absorbed), the product contains unchanged indole, dihydroindole and perhydroindole, the last being removed by shaking the Et<sub>2</sub>O soln. with 0.1 *N* HCl until the alk. reaction just disappears, and the first two being sepd. by fractional pptn. from Et<sub>2</sub>O with picric acid.

CHAS. A. ROUILLER.

**Isolation of dyes with picric acid and dichloropicric acid.** RICHARD WILLSTÄTTER AND GUSTAV SCHUDEL. Akad. Wiss. München. Ber. 51, 782-8 (1918).—The method of isolation of dyes occurring in nature based on the partition of the oxonium dyes between H<sub>2</sub>O and AmOH (C. A. 12, 1404) is not applicable to glucosidal dyes, but the use of the picrates of these dyes makes possible a methodical advance in this field. These dyes, which are easily sol. in H<sub>2</sub>O but insol. in Et<sub>2</sub>O and other solvents immiscible with H<sub>2</sub>O, can be transformed by means of picric acid from their aq. solns. into organic solvents. The method is applicable to the isolation of anthocyanins and other basic dyes of different classes. Thus fuchsin and parafuchsin can be quant. transferred from H<sub>2</sub>O to Et<sub>2</sub>O. Of the anthocyan dyes, when picric acid is added to solns. of their chlorides, anthocyanidines go over quant. into Et<sub>2</sub>O while monoglucosides (like chrysanthemin) and diglucosides (like cyanin) do not pass at all into alc.-free Et<sub>2</sub>O, but with suitable solvents the picrates of the glucosidal dyes can also be removed from aq. solns. Below are the partition nos. (% of dyes removed from H<sub>2</sub>O by the given solvent) of the picrates of mono- and diglucosides, resp.: Et<sub>2</sub>CO, about 50, 0; AmOH, 80-90, about 30; 2 parts AmOH + 1 part BzMe, 100, 70-80. Et<sub>2</sub>CO thus affords a good means of sepg. mono- and diglucosides, and carvone, in which the picrates are more sol., is even better for work with large amts., while with AmOH + BzMe dyes like cyanin can be extd. from aq. solns. such as fruit juices. For practical purposes, however, the picrates are in general not sol. enough in these solvents, and in this respect the dichloropicrates are more suitable. The partition nos. of the mono- and diglucoside dichloropicrates, resp., are as follows: Et<sub>2</sub>O, 40, about 3; Et<sub>2</sub>CO, almost 100, about 60; AmOH, 100, about 90; 2 parts AmOH + 1 part BzMe, 100, 100. By this means, fuchsin, parafuchsin and methylene blue can be completely transferred to Et<sub>2</sub>O, safranin to Et<sub>2</sub>CO. The prepn. of the reagent is described:  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2 + \text{Cl}$  (Flürscheim, C. A. 3, 885)  $\rightarrow$  2,6,4-Cl(O<sub>2</sub>N)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>NH<sub>2</sub> (yield, almost quant.) + HNO<sub>2</sub> (Holleman, Rec. trav. chim. 23, 366 (1904))  $\rightarrow$  3,5-Cl<sub>2</sub>C<sub>6</sub>H<sub>2</sub>NO<sub>2</sub> (yield, 82-3%) + Fe + HCl (Holleman, Rec. trav. chim. 25, 186 (1906))  $\rightarrow$  Cl<sub>2</sub>C<sub>6</sub>H<sub>2</sub>NH<sub>2</sub>. Blankensma's method for the conversion of the last into Cl<sub>2</sub>C<sub>6</sub>H<sub>2</sub>OH (C. A. 2, 1133) gives unsatisfactory yields. The product contains large amts. of 4-[3',5'-dichlorobenzeneazo]-3,5-dichlorophenol (a), the 2,4-diazo compound (b) and 4-nitroso-3,5-dichlorophenol (c). The mixt., after being boiled, is dissolved in Et<sub>2</sub>O, which leaves behind a part of the (b), the Et<sub>2</sub>O evapd., the residue dissolved in C<sub>6</sub>H<sub>6</sub> and the C<sub>6</sub>H<sub>6</sub> soln. shaken with very dil. NaOH, (b) remaining quant. in the C<sub>6</sub>H<sub>6</sub> as the Na salt. The aq. alk. soln. yields the (a) as the Na salt to Et<sub>2</sub>O while in the H<sub>2</sub>O there remain the phenol and

(c), sepd. by crystn. from petr. ether. (a), prepd. from its components in soda soln., sepa. from dil. alc. in silky, flat, brown-red prisms, m.  $191-2^{\circ}$ ; sodium salt, yellow prisms from NaOH, quant. extd. from 20% NaOH by  $\text{Et}_2\text{O}$ . (b) forms long orange needles, m.  $260-1^{\circ}$ . (c), from  $\text{C}_6\text{H}_5\text{ONa} + \text{NaNO}_2 + \text{H}_2\text{SO}_4$ , fine, very faintly greenish yellow prisms from  $\text{H}_2\text{O}$ , m.  $150-1^{\circ}$ .  $3,5\text{-Cl}_2\text{C}_6\text{H}_3\text{OH}$ , m.  $68^{\circ}$ , is obtained in 39.6 g. yield by stirring 54 g.  $\text{Cl}_2\text{C}_6\text{H}_3\text{NH}_2$  with 150 cc.  $\text{H}_2\text{SO}_4$  and 660 cc.  $\text{H}_2\text{O}$  to a paste, treating with stirring with 23 g. powdered  $\text{NaNO}_2$ , filtering when the reaction is complete and dropping into a vigorously boiling mixt. of 900 g.  $\text{H}_2\text{SO}_4$ , 500 g.  $\text{H}_2\text{O}$  and 600 g. anhydrous  $\text{Na}_2\text{SO}_4$  connected with a condenser, the distg. temp. being  $145-55^{\circ}$  and the addition of the soln. so regulated that the vol. of the liquid remains about constant. The phenol is isolated from the distillate by salting out and extg. with  $\text{Et}_2\text{O}$ ; 81.5 g. in 4 parts glacial AcOH is slowly added to 326 g. red fuming  $\text{HNO}_3$ , warmed 45 min. to  $70^{\circ}$ , moderately dild., made alk. with KOH, filtered, washed, decompd. with 2 N  $\text{H}_2\text{SO}_4$ , extd. with  $\text{Et}_2\text{O}$  and repeatedly washed with  $\text{H}_2\text{SO}_4$  until free from K; there is thus obtained about 90 g. of dichloropicric acid,  $3,5,2,4,6\text{-Cl}_2(\text{O}_2\text{N})_2\text{-C}_6\text{OH}$ , pale yellow prisms from AcOH, m.  $139-40^{\circ}$ ; 10 cc. of the satd. aq. soln. at  $19.7^{\circ}$  contains 0.74 g. acid, 0.74 g. Na salt, 0.055 g. K salt. The salts are lemon-yellow, the K salt forming fine needles, the Na salt 4-sided prisms. C. A. ROUILLER.

Degradation of starch by formaldehyde. H. MAGGI AND G. WOKER. Univ. Bern. *Ber.* 51, 790-3(1918); cf. C. A. 12, 1192.—The ppts. which, as described in earlier papers, M. and W. obtained by adding 96% alc. to the concd. dialyzates of their starch-HCHO mixts. and which they then considered to be dextrin, were redissolved in  $\text{H}_2\text{O}$  and allowed to stand about 2 months; there was an abundant growth of some as yet unidentified mold, and the strongly reducing filtrate from this yielded glucosazone. This same mold was found, by expt., to be able to convert dextrin into glucose, and the view expressed in the earlier papers that the dialyzable product formed in the starch-HCHO mixts. in dextrin is confirmed. A control expt. with  $\text{HCO}_2\text{H}$  showed that it is not the  $\text{HCO}_2\text{H}$  in the HCHO which breaks down the starch. C. A. R.

Nitrate and nitrite assimilation. XIII. Iron and oxygen as necessary agents for the reduction of alkali nitrites with autooxidizable compounds. OSKAR BAUDISCH. Beiersdorf & Co., and Eppendorfer Krankenhaus, Hamburg. *Ber.* 51, 793-805(1918); cf. C. A. 11, 2906.—The formation of hyponitrous acid (*Stickstoffsäure*),  $\text{HNO}$ , as a labile intermediate product in nitrate and nitrite reduction had thus far been definitely shown only in photochem. reactions (C. A. 5, 2826). It has now been found, however, that if 5 g. dextrose, 0.5 g.  $\text{FeSO}_4$  and 5 g.  $\text{NaHCO}_3$  in 150 cc. boiling distd.  $\text{H}_2\text{O}$  in a  $\text{CO}_2$  atm. are treated with 5 g.  $\text{KNO}_3$  the clear distillate gives no color with  $\text{FeCl}_3$  but if HCHO is added to the distg. flask the intense hydroxamic acid-Fe reaction can soon be obtained in the distillate. This reaction is not obtained in the first distillate on addition of HCHO; the exceedingly unstable  $\text{HNO}$  can be identified only if HCHO is added to the reaction mixt.  $\text{HCHO} + \text{HNO} = \text{HC}(\text{:NOH})\text{OH}$ . Like aldo- and keto-hexoses, so also pentoses, trioses and glycolaldehyde in the presence of  $\text{Fe}'$  and  $\text{Fe}''$  salts reduce only alkali nitrites and not the nitrates. Thus,  $\text{CO}(\text{CH}_2\text{OH})_2$  or acetol in soda boiled with a little  $\text{FeCl}_3$  forms brown-red soln. with violet tinge which reduces  $\text{KNO}_3$  intensely to  $\text{NH}_3$  but does not attack  $\text{KNO}_3$ . With the trioses it was again found that only aldoses and ketoses possess reducing power, the formation of  $\text{PhNH}_2$  from  $\text{PhNO}_2$  being used in this case as the indicator of reducing power; the Fe was supplied in complex combination—a few cc. of the violet-red soln. of 1 g. pyrocatechol-*o*-carboxylic acid (a) and 5 g. soda in 250 cc.  $\text{H}_2\text{O}$  and 10 drops of  $\text{FeCl}_3$ . Glycerol, glyceric acid, mannitol and HCHO in the presence of this soln. do not attack  $\text{PhNO}_2$ , while  $\text{CO}(\text{CH}_2\text{OH})_2$ , fructose and maltose immediately reduce it to  $\text{PhNH}_2$ . The foregoing expts. show that it is the configuration  $\text{RC}:\text{CH}_2\text{OH}$  or  $\text{RC}(\text{OH})\text{:CHOH}$  which is re-

sponsible for this peculiar reducing power, and it has been found that there is an extraordinarily large number of aromatic substances which behave like the sugars towards alkali nitrites, viz., those compds. found widely distributed in the vegetable kingdom which contain 2 or more HO groups in the  $C_6H_4$  ring, like pyrocatechol, quinol, pyrogallol, gallic acid, also phloroglucinol, quercetin, and the anthranols (chrysarobin), etc. All these, from dextrose to chrysarobin, are autooxidizable in alk. soln., forming active O and therefore having a strong oxidizing action, but in the presence of minute amts. of Fe in a masked form they at the same time reduce alkali nitrites; this reduction does not take place in the absence of O, except in the case of sugars which supply the necessary O from their own mols. Thus, if a soda soln. of 1,8-dihydroxyanthranol containing a few drops of  $FeCl_3$  is distd. with  $NaNO_2$  in a flask provided with an open tube reaching to the bottom of the liquid and through which air enters, NO soon begins to pass over with the distillate which gives the usual reactions for  $HNO_2$ , but contains no  $NH_3$ ; if, instead of air, N free from O is passed into the boiling soln., the evolution of NO soon ceases but if O is now substituted for the N the formation of NO again begins; this alternating process can be repeated many times. With dextrose in soda the admission of O is not necessary for the formation of NO. Nor is there any evolution of NO in the absence of Fe; in the case of 1,8-dihydroxyanthranol and other substances which form Fe complexes the addition of a little  $Fe(OH)_3$  is sufficient to start the evolution of NO, but with compds. like phloroglucinol the Fe must be added in the form of some such complex as  $K_4Fe(CN)_6$  or  $K_3Fe(CN)_6$ . Mn or Cu cannot be substituted for Fe. As to the role of the O in these reductions B. offers the explanation that the autooxidizable substances contain easily removed H atoms which under ordinary conditions are oxidized away by the coordinately bound  $O_2$  mol. while in the simultaneous presence of alkali nitrite and masked Fe it is probably a loose combination of the latter 2 which reacts with the labile H atoms. The part played by the masked Fe is not yet clear. It has been found, however, that these Fe complexes can exercise an oxidizing action on peroxides, with reduction and evolution of O. Thus, the deep violet-red (a)-Fe'' soln. in soda is decolorized by warming with  $H_2O_2$ , and after acidifying with dil. HCl and adding  $K_3Fe(CN)_6$  forms no Prussian blue, whereas the original soln. gives Prussian blue abundantly. (a)-Fe' solns. are colorless but are immediately colored intensely by the air. The possibility of a catalase action of the masked Fe atom in the above reductions of nitrites is not excluded. Possibly the autooxidizable phenols are plant hormones which play an important part in respiration.

C. A. ROUILLER.

**Direct transformation of nitriles into esters.** PAUL PFEIFFER. *Ber.* 51, 805 (1918).—With reference to the paper of Spiegel and Szydowski (*C. A.* 12, 2558), P. points out that he and Matton had already described the direct esterification of nitriles (*C. A.* 5, 2834).

C. A. ROUILLER.

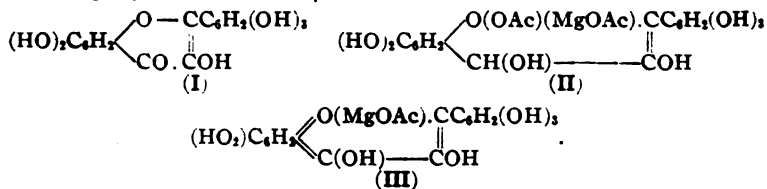
**Synthesis of N-methyltetrahydropyridinecarboxylic acids. I. A new method of formation of arecaine and of arecoline.** Clearing up of the constitution of guvacine and of arecaine. KURT HESS and FRIEDRICH LEIBBRANDT. Univ. Freiburg i.B. *Ber.* 51, 806-20(1918); cf. *C. A.* 11, 2801; Jahn, *Arch. Pharm.* 229, 669(1891).—Nipecotinic acid, from nicotinic acid, Pd and  $H_2$ , was isolated as its *acetate*,  $C_8H_{11}O_5N$ . AcOH, needles from AcOH, m. 289-90° (decompn.), which does not decomp. as easily as the HCl salt in  $H_2O$ ; with  $HCHO \cdot HCO_2H$  it was converted into N-methylhexahydronicotinic acid (a), whose *methyl ester hydrochloride*, needles from  $MeOH \cdot AcOEt$ , m. 193° (decompn.); Me ester methiodide, prismatic, often striated plates from alc., m. 192° (Willstätter, *Ber.* 30, 730(1897), gives 155-6°); chloromethylate Au salt, m. 123° (W., 111-2°). *Ethyl ester* of (a), obtained in 10-2 g. yield by passing HCl for 24 hrs. into the methylation product of 25 g. hexahydronicotinic acid in 150 cc. boiling

alc.,  $b_{24-1}$  101-2°, strongly refractive basic oil producing coughing, hydrolyzed by boiling 4 hrs. with 25 parts *N* HCl, the hydrolyzed soln. yielding with  $\text{Cu}(\text{OH})_2$  a greenish copper salt,  $\text{C}_{14}\text{H}_{24}\text{O}_4\text{N}_2\text{Cu}$ . When 6.5 g. of the Me ester of (a) in 30 cc. MeOH is boiled 2 hrs. with 6.5 g. Br in 20 cc. MeOH, then 0.5 hr. with 1.8 g. Na in 25 cc. MeOH, filtered from the NaBr and esterified, it gives 3-3.5 g. Me *N*-methyl- $\Delta^2$ -tetrahydronicotinate (arecoline),  $b_{17}$  94°, hydrolyzed by boiling 3 hrs. with 50 parts *N* HCl to the acid (arecaine), whose ruby-red Au salt m. 196° (J., 197-8°). In the above bromination HBr is partially split off even without addition of NaOMe with formation of arecoline and *arecaine hydrobromides*; the latter can be isolated by evapg. the bromination reaction mixt. *in vacuo* to a sirup, letting stand *in vacuo* over  $\text{P}_2\text{O}_5$ , treating the partly crystd. mixt. with  $\text{Me}_2\text{CO}$ , filtering and adding  $\text{C}_6\text{H}_6$  to the concd. alc. son. of the crystals; it seps. in needles, m. 197° (decompn.). Methyl *N*-methyl-hexahydronicotinate,  $b_{21}$  92-5°, was obtained in 1 g. yield by methylating 4 g. pipercolinic acid acetate in the usual way, evapg. the  $\text{Et}_2\text{O}$  soln. of the reaction product, dissolving in  $\text{CHCl}_3$ , treating with somewhat more than the calcd. amt. of  $\text{PCl}_5$ , decanting the soln. from the resulting tar, treating it with MeOH, evapg. *in vacuo*, decompg. with soda and extg. with  $\text{Et}_2\text{O}$ . Ethyl ester hydrochloride, obtained by passing HCl gas over the ester, table-like crystals, m. 204° (decompn.). From 18 g. of the Et ester in 50 cc. alc. boiled with 16.8 g. Br in 50 cc. alc. and then with 5 g. Na in 100 cc. alc. and esterified with HCl in boiling alc. is obtained 12-3 g. of ethyl *N*-methyl- $\Delta^2$ -tetrahydronicotinate, refractive, strongly basic oil of somewhat sweetish, pleasant odor,  $b_{17}$  96°. Methyl ester, obtained in 1.7-2.0 g. yield from 3 g. of the hexahydro Et ester, possesses the same properties as the Et ester, reduces faintly alk.  $\text{KMnO}_4$  and Br  $\text{H}_2\text{O}$  in the cold, does not react with dil.  $\text{HNO}_3$ . Free acid obtained in 7-7.5 g. yield by shaking 8 g. of the Et ester with 8 g.  $\text{Ba}(\text{OH})_2$  in 80 cc.  $\text{H}_2\text{O}$  48 hrs. at 16°, crystals with 0.5  $\text{H}_2\text{O}$  from alc.- $\text{Et}_2\text{O}$ , sublimes somewhat at 110° and still more at 140°, m. 213-4°, sol. in 2 parts warm alc., forms a tasteless, neutral aq. soln., gives no color with  $\text{FeCl}_3$ ; hydrochloride, m. 210°; chloroplatinate, prisms from  $\text{H}_2\text{O}$ , m. 220° (decompn.); chloroaurate, short prisms, m. 200°. The acid and its derivs. resemble so closely the description given by Jahn of his arecaine that the 2 substances were believed to be identical until the latter was prepd. from the natural guvacine, when some errors in J.'s description were discovered. Three g. Merck's guvacine, which became only slightly yellow when heated to 270° and showed no tendency to melt (J.'s product darkened 265° and m. 271° (decompn.)), heated in 10 cc.  $\text{H}_2\text{O}$  with 1.8 g. 40%  $\text{HCHO}$  and 2.4 g.  $\text{HCO}_2\text{H}$  8 hrs. at 155-60°, gave 2.5 g. arecaine, m. 231° (decompn.) (J., 213-4°), seps. from 50% alc. with 1  $\text{H}_2\text{O}$ ; hydrochloride, seps. from abs. alc. in well defined crystals, m. 250° (decompn.); chloroplatinate, octahedrons, m. 220° (decompn.); chloroaurate, short prisms, m. 200° (foaming). From 2.6 g. of the HCl salt esterified with HCl and  $\text{EtOH}$  is obtained 2.3 g. of guvacine ethyl ester, strongly alkaline oil of faintly basic, not unpleasant odor,  $b_{17}$  116°, at once decolorizes alk.  $\text{KMnO}_4$  and Br  $\text{H}_2\text{O}$ , gives with more Br an oily insol. substance, probably the dibromide. With colloidal Pt and H, guvacine gives isonipecotinic acid. Guvacine and arecaine are therefore tetrahydro- and *N*-methyltetra- $\gamma$ -picolinic acids, resp., the position of the double bond still being undetd., but from analogy with arecaine, H. and L. consider the  $\Delta^2$ -structure,  $\text{CH}_2\text{CH}_2\text{NHCH}_2\text{CH}(\text{CO}_2\text{H})$ , most probable.

C. A. R.

**Anthocyanins: color-variation in anthocyanins.** KEITA SHIBATA, YUJI SHIBATA AND ITIZO KASIWAGI. *J. Am. Chem. Soc.* 41, 208-20(1919).—Former investigators have invariably used metallic Zn or Mg and excess of inorganic acid to reduce the yellow plant pigments of the flavonol series and obtained red anthocyanin pigments, the oxonium salts of Willstätter, but S., S. and K. have used organic acids. With mono-

basic acids they obtained, for the most part, deep green to bluish green pigments, depending on the reagent used, and have been able to isolate some of the pigments. Myricetin (I) with glacial AcOH and Mg gives compds. of the compn.  $C_{14}H_{11}O_8MgOAc \cdot nMg(OAc)_2$  ( $n = 2$  or  $4$ ). They represent the reaction as consisting in the formation, by reduction, of a phenopyrylium compd. (II) which, by loss of AcOH, yields the organo-metallic compd. (III) and this adds 2 or 4 mols. of  $Mg(OAc)_2$  according to Werner's coördination theory. Similarly myricitrin gives a deep blue product coördinated with  $4Mg(OAc)_2$ . These blue or green pigments are sol. in  $H_2O$  and alc. with the same color and form neutral solns., but with dil. acids the color changes to red with formation of the oxonium salt. Even with inorganic acids under certain conditions green or blue pigments are formed, myricetin with alc. HCl forming a deep green pigment (III, with  $MgCl_2$  instead of  $MgOAc$ ); in this case  $MgCl_2$  does not add coördinately. On the basis of their work, S., S. and K. conclude that organo-metallic or complex compds. of reduced flavonol glucosides are the most important factor in the production of flower colors; that the "blue" anthocyanins are the complex compds. of reduced flavonol glucosides containing several HO groups of the flavonol nucleus besides those of sugar mols. and the metal with which they are coördinated is probably Ca or Mg; and that the "violet," "violet-red" and "red pigments" are either the analogous metallic complex compds. of flavonol glucosides containing fewer auxochrome HO groups or are a mixt. of the blue pigments and their products of decompn. by excess of acids, *i. e.*, Willstätter's red oxonium salts. The theory proposed is confirmed by the fact that in alc. exts. of various flowers treated with salts of the alk. earths and heavy metals the color change is always bathochromatic, *e. g.*, from red or violet-red to beautiful blue or violet. The reversible color change of the exts. of some petals produced by temp. changes is interpreted as due to the formation and decompn. of the complex compds. Tables are given, showing the color of the pigment produced by reduction of myricetin in alc.,  $Me_2CO$  and  $Et_2O$  with Mg and formic, acetic, propionic, butyric, valeric, lactic, oxalic, citric, benzoic, *m*-nitrobenzoic, cinnamic, chloroacetic, trichloroacetic and camphoric acid, the colors produced by adding 1 drop of  $H_2O$  or dil. HCl to the reduced  $Me_2CO$  solns., the colors obtained by reduction of quercitin, quercitrin, rutin, kempferol, chrysin and toringin in alc., the colors obtained by reduction of myricetin with AcOH,  $ClCH_2CO_2H$  and  $CCl_3CO_2H$  and Zn in alc. and  $Et_2O$  and with Al-Hg in alc., and finally with Mg, Fe and Zn and HCl, HBr,  $HNO_3$ ,  $H_2SO_4$ ,  $H_3PO_4$  and  $H_2PO_3$ ; and finally the colors produced by adding salts of Ca, Sr, Ba, Mg, Zn, Al, Sn, Pb, Cr,  $NH_4$ , Mn, Fe, Ni, Co, Cu and Hg and AcOH, HCl, NaOH and  $K_2CO_3$  to alc. exts. of 24 flowers.



CHAS. A. ROUILLER.

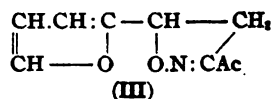
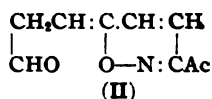
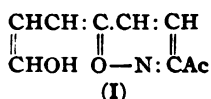
2-Phenylcoumarins. ADOLF SONN. Univ. Königsberg i. Pr. *Ber.* 51, 821-7 (1918); cf. v. Meyer, *J. prakt. Chem.* 67, 342(1903).—The product of the action of HCl gas on  $PhC(:NH)CH_2CN$  (a) and *m*- $C_6H_4(OH)_2$  in glacial AcOH, purified through the Ac deriv. (silky needles from alc., m.  $121-2^\circ$ ), is identical with 7-hydroxy- $\beta$ -phenylcoumarin, tablets, m.  $245-6^\circ$  (v. Pechmann and Hanke, *Ber.* 34, 356(1901)), and not 7-hydroxyflavone, as believed by v. M. The reaction therefore does not follow the course he suggests; the first product is  $BzCH_2CN$  which then condenses with the  $C_6H_4$ -

(OH)<sub>2</sub>. Likewise with phloroglucinol (a) gives 5,7-dihydroxy- $\beta$ -phenylcoumarin, identical with the product obtained from  $\text{BzCH}_2\text{CO}_2\text{Et}$ , phloroglucinol and  $\text{ZnCl}_2$  (v. Kostanecki, *Ber.* 26, 2907(1893)).  $p\text{-MeOC}_6\text{H}_4\text{COCH}_2\text{CN}$  (b) (Bargellini and Forli-Forli, *C. A.* 5, 3805), prisms from alc., m.  $129\text{--}30^\circ$  (B. and F.-F.,  $128^\circ$ ), is obtained in 7.2 g. yield by gradually warming 10 g. KCN in 30 cc.  $\text{H}_2\text{O}$  and 30 cc. alc. with 8 g.  $\text{MeOC}_6\text{H}_4\text{COCH}_2\text{Cl}$  up to  $80^\circ$ , dilg. with considerable  $\text{H}_2\text{O}$ , filtering and acidifying; 4 g. of this and 3 g. anhydrous phloroglucinol suspended in 30 cc. AcOH and satd. with HCl give 4.7 g. crystals which, boiled 15 min. in 30 parts  $\text{H}_2\text{O}$ , yield 5,7-dihydroxy-4'-methoxy- $\beta$ -phenylcoumarin (c), flat prisms from 60% alc., sol. in concd.  $\text{H}_2\text{SO}_4$  with faint yellow color, gives only a faint and not characteristic color with  $\text{FeCl}_3$  in alc.; it is purified through the diacetate, flat prisms or elongated tables from alc., m.  $189\text{--}90^\circ$ .  $p\text{-Methoxybenzimidazoacetoniirile}$ ,  $\text{MeOC}_6\text{H}_4\text{C}(\text{NH})\text{CH}_2\text{CN}$ , obtained in 10.5 g. yield from 4.6 g. Na, 13 g.  $\text{MeOC}_6\text{H}_4\text{CN}$  and 8 g. MeCN in 50 cc.  $\text{Et}_2\text{O}$  warmed some hrs. on the  $\text{H}_2\text{O}$  bath and then decompd. with  $\text{H}_2\text{O}$ , prisms from AcOEt, m.  $119^\circ$ , yields (b) with dil. acids. When 10.5 g. (b) and 7.6 g. phloroglucinol suspended in  $\text{Et}_2\text{O}$  are satd. with HCl and allowed to stand overnight there are obtained 4.5 g. unchanged (b) and 3 g. 5,7-dihydroxy-4'-methoxy- $\beta$ -phenylcoumarin imino ether,  $(\text{HO})_2\text{-C}_6\text{H}_2\text{O.C}(\text{NH})\text{CH}:\text{CC}_6\text{H}_4\text{OMe}$ , crystals from 80% AcOH, decomp. above  $300^\circ$ , gives (c) on warming with  $\text{H}_2\text{O}$  or dil. acids.

CHAS. A. ROULLER.

**Isomerization of furaldiacetyl mono-oxime.** OTTO DIELS AND HERMANN ROEHLING. Univ. Kiel. *Ber.* 51, 828-36(1918).—Furaldiacetyl mono-oxime (a) is obtained in 50 g. yield from 50 g. furfural and 50 g.  $\text{AcC}(\text{:NOH})\text{Me}$  by D. and Sharkoff's modified method (*C. A.* 7, 2940); gently warmed with  $\text{Ac}_2\text{O}$  it yields almost quant. the acetate, prisms from MeOH, m.  $141^\circ$ , stable towards weak bases ( $\text{C}_6\text{H}_5\text{N}$ , carbonate), evolves a peculiar pleasant odor when warmed with bicarbonate in the presence of a little alc.; 1.6 g. gently warmed with 3 cc. of 33% KOH suddenly reacts violently with formation of a liquid of ethereal odor (which was not further investigated); on addition to the reaction mixt. of 13 cc. of  $\text{H}_2\text{O}$  and acidification there is obtained 0.8 g. of furfuracrylic acid. Unlike  $\text{PhCH}:\text{CHC}(\text{:NOH})\text{Ac}$ , which with concd. HCl gives an isoxazole deriv., when 5 g. finely powdered (a) is covered with 10 cc. concd. HCl it dissolves with evolution of heat and production of an intense olive-green color changing to brown and there soon seps. 4.3 g. of the cryst. salt,  $\text{C}_8\text{H}_7\text{O}_2\text{N.HCl}$ , leaflets from concd. HCl, turns brown about  $118^\circ$ , decomp.  $128\text{--}9^\circ$ , dissolves at once, with elimination of HCl, when rubbed with  $\text{H}_2\text{O}$  or with bicarbonate, gives a deep blue-red color with  $\text{FeCl}_3$  in alc. The free base (b), obtained by alternately bringing together small portions of the above salt and a few drops of bicarbonate soln., avoiding a great excess of alkali at any time and leaving the mixt. slightly acid at the end, is a greenish yellow powder sepg. from a little MeOH in needles, m.  $145^\circ$ , instantly dissolved by concd. HCl with characteristic olive-green color, sol. with orange-yellow color in dil. alkalies, carbonates and  $\text{NH}_4\text{OH}$ , instantly reduces Fehling soln. and  $\text{NH}_3\text{-AgNO}_3$ , gives in alc. with  $\text{FeCl}_3$  a deep violet-red color which disappears after a few moments, but is brought out again by more  $\text{FeCl}_3$ ; with excess of  $\text{FeCl}_3$  is obtained a deep  $\text{KMnO}_4$ -red color changing to light brown on long standing; with  $\text{PhN}_2\text{Cl}$  it couples instantly to a deep red compound sepg. from  $\text{Me}_2\text{CO}$  in thick hexagonal prisms; with  $\text{NH}_2\text{CONHNH}_2$  it gives a compound m.  $228\text{--}9^\circ$ ; with  $\text{ClCO}_2\text{Me}$  in  $N$  NaOH it yields the carbomethoxy derivative,  $\text{C}_{11}\text{H}_{11}\text{O}_4\text{N}$ , needles from  $\text{C}_6\text{H}_6$ , m.  $128\text{--}9^\circ$ , slowly sol. in dil. alkalies with yellow color;  $p\text{-nitrophenylhydrazones}$ , brown-red needles from MeOH, decomp.  $136\text{--}7^\circ$ . When 4.6 g. (b) is covered with 10 cc. of 50% aq.  $\text{NH}_2\text{Me}$  and allowed to stand there is pptd. about 1 g. of a substance sepg. from MeOH in thick  $\text{K}_2\text{CrO}_4$ -red rhombohedrons, m.  $183^\circ$ , while on still longer standing there seps. a compound  $\text{C}_{10}\text{H}_{12}\text{O}_2\text{N}_2$ , light yellow needles

from MeOH, m. 175°. D. and R. believe that the first step in the action of HCl on (a) consists in the opening of the furan ring and addition of H<sub>2</sub>O, with formation of HOCH:CHCH:C(OH)CH:CHC(:NOH)Ac, and that this, by loss of H<sub>2</sub>O, yields (b) which has the structure (I) or (II) (in soln. probably both forms exist simultaneously).

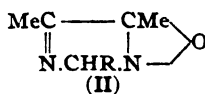
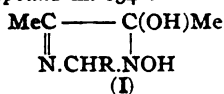


This structure is confirmed by the fact that (b) boiled in Me<sub>2</sub>CO with dil. H<sub>2</sub>SO<sub>4</sub> or heated in MeI at 100° is converted into the isomeric  $\alpha$ -furyl- $\gamma$ -acetyl- $\alpha,\beta$ -dihydroisoxazole (III), also obtained directly by boiling (a) in at least 50 parts H<sub>2</sub>O for 1 hr.; (III) seps. from MeOH in soft needles, m. 103-4°, indifferent towards CH<sub>2</sub>N<sub>2</sub>. C. A. ROUILLER.

The course of the reaction between diacetyl mono-oxime and aldehydes in the presence of ammonia: formation of dihydroxy[dihydroglyoxalines]. OTTO DIELS. Univ. Kiel. *Ber.* 51, 965-76(1918).—AcC(:NOH)Me (a) in the presence of NH<sub>3</sub> reacts with aldehydes with the greatest ease but the products are of a different type from those obtained in the presence of concd. HCl (*C. A.* 9, 2250) or concd. KOH (*C. A.* 7, 2940), being trialkyldihydroxy[dihydroglyoxalines] (I), probably formed by interaction of the (a), aldehyde and NH<sub>3</sub> with elimination of 2 mols. of H<sub>2</sub>O and production of the intermediate compd. (II), which then adds H<sub>2</sub>O to give (I). Thus, when 150 g. (a), 150 g. BzH, 120 g. of 25% NH<sub>4</sub>OH and 150 cc. alc. are brought together the temp. first falls and a clear brown soln. results; the temp. then rises and is kept at about 65°; the reaction is soon complete and on cooling and rubbing crystn. soon begins; after standing 20 hrs. there is obtained 280 g. of the compound C<sub>11</sub>H<sub>14</sub>O<sub>2</sub>N<sub>2</sub> (I, R = Ph), m. 120-1° (decomp.), becomes superficially yellow in bright light, sol. in cold. dil. NaOH and in hot soda, more concd. NaOH pptg. the Na salt as a very finely cryst. mass; it is also instantly sol. in dil. H<sub>2</sub>SO<sub>4</sub>, the cryst. sulfate soon sepg.; the nitrate seps. in prisms; heated above its m. p. it loses H<sub>2</sub>O and resolidifies, owing to the formation of the compound (II), m. 180°. When 75 g. (I) in 1800 cc. dil. H<sub>2</sub>SO<sub>4</sub> are treated with 280 g. K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in 1500 cc. hot H<sub>2</sub>O and distd. there first passes over an oil with the odor of o-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>Me and crystals soon appear; the receiver is changed and about 750 cc. more of liquid are distd. over and on cooling 22 g. BzOH are obtained in the distg. flask and from the 2nd distillate. The first distillate is made alk., extd. with Et<sub>2</sub>O, dried with MgSO<sub>4</sub>, and fractionally distd.; it yields a little AcOH and 8-10 g. 5-methyl-3-phenyl-1,2,4-oxdiazole (Tiemann and Krüger, *Ber.* 17, 1696(1884)), b<sub>763</sub> 252-3°, m. 41°. From 50 g. (a), 50 g. furfural, 40 g. of 25% NH<sub>4</sub>OH and 50 cc. of 95% alc. is obtained 42 g. (in H<sub>2</sub>O without alc. the yield from 25 g. each of (a) and furfural and 20 g. NH<sub>4</sub>OH is 35 g.) of the compound C<sub>9</sub>H<sub>12</sub>O<sub>2</sub>N<sub>2</sub>, brownish leaves from H<sub>2</sub>O, sinters 105°, m. 112-3° (foaming) solidifies and m. again 170-1°, sol. in cold dil. HCl, the hydrochloride sepg. from the soln. in prisms; the compd. is sol. in concd. H<sub>2</sub>SO<sub>4</sub> with faint amethyst color changing to an emerald-green on addition of a very little HNO<sub>3</sub>; it is also sol. in cold dil. alkalies and 25% NH<sub>4</sub>OH and becomes intensely yellow in bright light. Heated at its m. p. or crystd. from boiling Me<sub>2</sub>CO, it loses H<sub>2</sub>O and forms the compound C<sub>9</sub>H<sub>10</sub>O<sub>2</sub>N<sub>2</sub>, m. 170-1°, converted back into the original compd. in contact with H<sub>2</sub>O and forms the same salts as the latter on treatment with acids and alkalies. If the reaction between (a), furfural, and NH<sub>4</sub>OH in alc. is carried out at 0°, the product is hydrofurfuramide, m. 117° (30 g. from 50 g. (a)). The compound C<sub>13</sub>H<sub>16</sub>O<sub>2</sub>N<sub>2</sub>, obtained in 13 g. yield from 20 g. (a) and 26 g. PhCH:CHCHO, faintly yellowish prisms from MeOH, sinters 131°, m. 138-9°, easily sol. in dil. alkalies, gives the Na salt (needles) with more concd. NaOH, forms a difficultly sol. hydrochloride, sulfate (hexagonal tables), and nitrate, yields BzH with K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in boiling dil. H<sub>2</sub>SO<sub>4</sub>.



(I) ( $R = Ph$ ) is reduced by Zn dust in boiling 50% AcOH to a compound  $C_{11}H_{14}N_2$ , needles from  $C_6H_6$ , m.  $242^\circ$ , has a very marked power of subliming, insol. in hot or cold alkalis, sol. in very dil. HCl at room temp., in 20% HCl only on warming, forms a cryst. hydrochloride, sulfate and nitrate. AcH and (a) do not give directly a compd. of type (I); from 150 g. (a), in 1200 cc.  $H_2O$  treated with 45 g. AcH- $NH_3$  is obtained 129 g. of a compound  $C_{10}H_{17}O_2N_2$ , corresponding to (I) + (a) -  $H_2O$ , crystals from MeOH, m.  $129-30^\circ$ , converted into (a) and (I) ( $R = Me$ ) under the most varied conditions; e. g., by dil. alkalis or acids, even in  $H_2O$ , or by treatment with  $PhNHNH_2$  in dil. AcOH. The compound (I,  $R = Me$ ), best obtained (in 17 g. yield, together with 8 g. (a)) by dissolving 25 g. of the preceding compd. in 120 cc. hot  $H_2O$ , quickly cooling to room temp., extg. twice with  $Et_2O$  and evapg. the aq. soln., crystals from  $Me_2CO$ , has an intensely bitter-sweet taste, m.  $80-1^\circ$ , evolves gas energetically when heated on Pt, then becomes viscous and finally deflagrates suddenly, loses 1 mol.  $H_2O$  on gentle heating, forming a compound m.  $134^\circ$ .



CHAS. A. ROUILLER.

**New derivatives of antipyrine containing selenium.** FRITZ VON KONEK AND OSKAR SCHLEIFER. Univ. Budapest. *Ber.* 51, 842-55(1918); cf. *Chem. Ztg.* 1913, 1036, 1168; *C. A.* 8, 2320; Ger. pat. 299,510.—To 2 mols. pure dry antipyrine (a) in 50 much abs., alc.-free  $CHCl_3$  that no crystals sep. on cooling below  $0^\circ$  is slowly added 1 mol.  $Se_2Cl_2$  in  $CCl_4$ , best in a  $CO_2$  atm.; a yellowish ppt. quickly changing to red at once begins to sep. and towards the end converts the  $CHCl_3$  soln. into a thick paste. After short standing this is quickly drained, spread on clay, dried *in vacuo* over paraffin, powdered, macerated 2-3 hrs. with  $H_2O$ , again dried *in vacuo*, dissolved in hot 96% alc. and treated with hot  $H_2O$  to incipient turbidity; on cooling *diantipyril diselenide* (b),  $(C_{11}H_{11}ON_2)_2Se_2$ , seps. in yellow needles (which are freed from the small amt. of accompanying monoselenide by shaking with a little  $CHCl_3$ ), m.  $215-6^\circ$ . Its salts with even the strongest acids are instantly decompd. by  $H_2O$ . Shaking in  $CHCl_3$  with Hg serves only to purify it by removing traces of adherent metallic Se; no addition product similar to that obtained with the S analog is formed. Repeated crystn. from boiling  $C_6H_6$  or treatment with concd. HCl results in the sepn. of 1 atom of Se, whence it is concluded that, as is also generally accepted for  $Se_2Cl_2$ , (b) has the asym. structure  $R_2Se:Se$ . *Diantipyril monoselenide* (c) from (b) treated with HCl as long as Se seps., pearly iridescent scales from  $C_6H_6$ , m.  $240^\circ$  (decompn.), probably identical with the product obtained by the patented process ((a) treated with Se or  $SeO_2$  and concd.  $H_2SO_4$ ); its salts are immediately hydrolyzed in  $H_2O$ . HCl in  $CHCl_3$  yields the *dihydrochloride* as a light yellow amorphous ppt. assuming a reddish shade in the desiccator. *Mercuric chloride compound*, needles from alc. *Diantipyril selenium dichloride*,  $(C_{11}H_{11}ON_2)_2SeCl_2$ , from (a) and  $SeCl_4$  in  $CHCl_3$ , pearly scales from  $C_6H_6$ , m.  $225^\circ$ ; boiled with HCl (1:3) or with KOH, it gives (c); side reactions also take place, a small amt. of a substance free from Se but rich in Cl, m.  $85-7^\circ$ , being isolated. Neither  $TeCl_2$  nor  $TeCl_4$  could be made to react with (a). In the combustion of Se compds. good results were obtained by filling half of the long combustion tubes with  $PbCrO_4$ , half with  $CuO$  and having a 12-5 cm. layer of  $PbO_2$  at  $180-200^\circ$  at the front end of the tube. For detg. the Se good results were obtained by heating 0.2-0.3 g. substance with 10-2 cc.  $H_2SO_4$  until the soln. assumes a brownish green color or a chocolate-brown emulsion begins to appear (before the appearance of  $H_2SO_4$  fumes), cooling, pouring into 200 cc.  $H_2O$ , satg. with  $SO_2$ , boiling, adding 100 cc. more  $H_2O$ , letting stand overnight, filtering on a weighed paper and washing with hot  $H_2O$  and alc. The objectionable

feature of the method is that neither the length nor temp. of the heating with  $\text{H}_2\text{SO}_4$  can be detd. with absolute certainty; too long heating leads to partial oxidation to  $\text{H}_2\text{SeO}_4$ , the subsequent reduction of which in the presence of excess of  $\text{H}_2\text{SO}_4$  presents difficulties. The Frerich method (decompn. with  $\text{HNO}_3$  in the presence of  $\text{AgNO}_3$  and titration of the resulting  $\text{Ag}_2\text{SeO}_3$  with  $\text{NH}_4\text{CNS}$ ) also gave good results. The other methods tried (evapn. with  $\text{HNO}_3$ , oxidation with  $\text{HNO}_3\text{-KClO}_4$  or  $\text{Na}_2\text{O}_2$  and combustion in the calorimetric bomb with O under pressure) were not satisfactory.

CHAS. A. ROUILLER.

Some new derivatives of *p*-coumaric and vanillic acid. FRITZ VON KONEK AND EUGEN PACSU. Univ. Budapest. *Ber.* 51, 855-65(1918); cf. *Chem. Ztg.* 1914, 1195.—*p*- $\text{HOC}_6\text{H}_4\text{CH:CHCO}_2\text{H}$ , needles, m.  $206^\circ$  (decompn.), is obtained in 28 g. yield by heating an intimate mixt. of 40 g. *p*- $\text{HOC}_6\text{H}_4\text{CHO}$  and 64 g. anhydrous  $\text{NaOAc}$  with 100 g.  $\text{Ac}_2\text{O}$  8 hrs. at  $140\text{--}50^\circ$ , cooling to  $100^\circ$ , adding 1 l. boiling  $\text{H}_2\text{O}$ , filtering, washing well with  $\text{H}_2\text{O}$ , boiling a short time with 1.5 l. dil.  $\text{NaOH}$ , pptg. with excess of dil.  $\text{HCl}$ , boiling with 2-2.5 l.  $\text{H}_2\text{O}$ , filtering, satg. with  $\text{CaCO}_3$ , decolorizing with charcoal, filtering, pptg. with  $\text{HCl}$  and crystg. twice more from much  $\text{H}_2\text{O}$ . Me ester, obtained in 80% yield from the acid in  $\text{MeOH}$  satd. with  $\text{HCl}$  and allowed to stand 12 hrs., refractive, table-like crystals from alc., m.  $136\text{--}7^\circ$ , long needles from petr. ether; 2 g. of the ester with 0.5 g.  $\text{NaOH}$  in 50 cc.  $\text{H}_2\text{O}$  shaken 0.5 hr. with 2.2 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$  in 50 cc.  $\text{Et}_2\text{O}$  yields 3.3 g. *methyl-p-nitrobenzoyl-p-coumarate*,  $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{C}_6\text{H}_4\text{CH:CHCO}_2\text{Me}$ , silky microneedles from  $\text{Ac}_2\text{O}$ , m.  $203^\circ$ , unchanged by short boiling with acids but quickly hydrolyzed by alkalis with formation of an intense red color. From 1 g. of the  $\text{NO}_2$  ester in 30 cc. alc. satd. with  $\text{HCl}$  treated slowly with the calcd. amt. of finely granulated  $\text{Sn}$  is obtained 0.7 g. of the *amino ester hydrochloride*, long needles from aq.  $\text{HCl}$ , becomes reddish  $205^\circ$ , decomp.  $215^\circ$ , sol. only in 1800 parts boiling  $\text{H}_2\text{O}$  containing  $\text{HCl}$ ; the *sulfate*, short needles, is still less sol. Free *amino ester*, obtained by dropping concd.  $\text{NH}_4\text{OH}$  into the boiling soln. of the salt and pptd. from alc. by  $\text{H}_2\text{O}$ , m.  $168\text{--}9^\circ$ . *p*- and *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$  are obtained in 19.3 and 8.8 g. yield, resp., by warming 30 g.  $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{H}$  with 300 g.  $\text{HNO}_3$  (d. 1.5) and 30 g. fuming  $\text{HNO}_3$  to  $85^\circ$ , pouring the purple soln. into 2 l. ice  $\text{H}_2\text{O}$ , filtering after 2 hrs., washing until the wash  $\text{H}_2\text{O}$  is free from acid, dissolving in 1.5 l. boiling  $\text{H}_2\text{O}$  and cooling to  $65^\circ$ , whereupon the *p*-acid seps. almost completely; the soln. is rapidly filtered and on further cooling the *o*-acid begins to sep. *p*-Nitrohydrocinnamyl chloride, from the acid and  $\text{SOCl}_2$  heated 1.5 hrs. on the  $\text{H}_2\text{O}$  bath, m.  $34\text{--}5^\circ$ , b<sub>16</sub>  $189\text{--}92^\circ$ . *Methyl p-nitrocinnamyl-p-coumarate*, needles from alc., m.  $131\text{--}2^\circ$ , unchanged by short boiling with acids, hydrolyzed by alkalis. *p*-Amino ester hydrochloride, obtained in 0.5 g. yield from 1 g. of the  $\text{NO}_2$  ester, decomp. about  $250^\circ$ , softening and reddening at a much lower temp., sol. in about 600 parts boiling  $\text{H}_2\text{O}$  containing  $\text{HCl}$ . *Sulfate*, microneedles. Free *amino ester*, long needles from alc., m.  $153\text{--}4^\circ$ . 5-Nitrovanillic acid, obtained in 62% yield from vanillin by Vogl's method (*Monatsh.* 20, 391), when heated 1 hr. on the  $\text{H}_2\text{O}$  bath with 5 parts  $\text{SOCl}_2$  gives the *chloride*, yellow, m.  $93\text{--}4^\circ$ ; short warming with  $\text{MeOH}$  converts it into the *methyl ester (methyl 3-methoxy-4-hydroxy-5-nitrobenzoate)*, light yellow needles from alc., m.  $148\text{--}9^\circ$ . This cannot be benzoylated by the usual methods (heating with  $\text{BzCl}$  or by the Schotten-Baumann process) but when 4.2 g. in 20 g.  $\text{C}_6\text{H}_5\text{N}$  is gently warmed 2 hrs. with 2.6 g.  $\text{BzCl}$  and allowed to stand 12 hrs. there is obtained 4.2 g. of *methyl 3-methoxy-4-benzoyloxy-5-nitrobenzoate*, light yellow-brown needles from alc., m.  $124\text{--}5^\circ$ , gives  $\text{BzOH}$  on long heating with acids, decompd. in hot alc. by  $\text{NaOH}$  with formation of an intense red color and production of the characteristic odor of  $\text{BzOEt}$ ; 1 g. reduced as above gives 0.5 g. of the *amino ester*, needles from alc., m.  $188\text{--}90^\circ$ ; *hydrochloride*, needles from aq.  $\text{HCl}$ , reddens  $200^\circ$ , decomp.  $236\text{--}40^\circ$ . *Sulfate*, short microneedles. The above  $\text{NH}_2$  ester hydrochlorides

have no action on the uninjured epidermis and do not show the specific anesthetic action of cocaine on the tongue.

CHAS. A. ROUILLER.

**Synthesis of some new naphthylpyrazolones.** FRITZ VON KONEK AND RICHARD MITTERHAUSER. Univ. Budapest. *Ber.* 51, 865-71 (1918); cf. *Chem. Ztg.* 1914, 1195.—*1-β-Naphthyl-3-methyl-4-benzyl-5-pyrazolone*,  $C_{16}H_{11}N.N:CHMe.CH(CH_2Ph)CO$ , faintly

pink needles from alc., m.  $153^\circ$ , is prepd. by stirring together 22 g.  $AcCH(CH_2Ph)CO_2Et$ , and 16 g.  $C_{10}H_7NHNH_2$ , whereby the temp. rises to  $35^\circ$ , and after 15 min. heating to  $90^\circ$ , then, after the vigorous foaming has ceased, to  $130-5^\circ$ ; after 0.5 hr. the product is poured into 100 cc. warm  $Et_2O$  and the ppt. is dissolved in excess of dil.  $NaOH$ , filtered and pptd. with 10%  $HNO_3$ ; it is insol. in acids; *picrate*, canary-yellow felted needles from very dil. soln. in alc. *4-Isopropyl analog*, yellowish needles from alc., m.  $160^\circ$ ; the  $NaOH$  soln., after exact neutralization of the excess of  $NaOH$  with  $HNO_3$ , gives colored caseous ppts. with  $Co$ ,  $Cu$  and  $Ag$  salts; *picrate*, yellow felted needles from alc. *1-α-Naphthyl-3-methyl-4-benzyl-5-pyrazolone*, obtained with much greater difficulty than the  $\beta$ -isomer and only when the purest reagents are employed (yield 50 g. from 28 g.  $\alpha-C_{10}H_7NHNH_2$  and 38 g.  $AcCH(CH_2Ph)CO_2Et$ ), faintly yellow rosetts from alc., m.  $168^\circ$ ; *picrate*, canary-yellow needles. *4-Isopropyl analog*, could not be obtained pure, even as a *picrate*. *1-β-Naphthyl-3-methyl-4-benzyl-5-benzoyloxypyrazole*, from 3 g. of the pyrazolone and 1.5 g.  $NaOH$  in 100 cc. warm  $H_2O$  treated with 4 g.  $BzCl$ , yellow needles from alc., m.  $138^\circ$ . No cryst.  $Bz$  derivs. of the  $\alpha-C_{10}H_7$  compds. could be obtained. The  $\alpha$ -naphthylpyrazolone (2 g.) in 50 cc. alc. treated with 3 g. powdered  $NaNO_2$  and concd.  $HCl$  yields the *dipyrazolone*,  $C_{22}H_{14}O_2N_4$ , crystals from alc., m.  $215^\circ$ . *1-β-Naphthyl-3-methyl-5-pyrazolidone*,  $C_{16}H_{11}N.NH.CHMe.CH_2CO$ ,

from 25 g.  $C_{10}H_7NHNH_2$  and 14 g. solid crotonic acid cautiously heated to  $135^\circ$ , crystals from alc., m.  $107^\circ$ , insol. in alkalis, sol. with difficulty but completely in hot concd.  $HCl$ , only partially oxidized by  $FeCl_3$  in alc. to the pyrazolone. *1-β-Naphthyl-4-benzyl-5-methyl-3-pyrazolone*, from 10 g.  $C_{10}H_7NHNHAc$ , 11 g.  $AcCH(CH_2Ph)CO_2Et$  and 7 g.  $PCl_5$ , yellow needles from xylene, m.  $208^\circ$ . *4,4'-Diphenylenebis[3-methyl-4-benzyl-5-pyrazolone]*, from  $(p-NH_2NHC_6H_4)_2$  and  $AcCH(CH_2Ph)CO_2Et$ , yellowish powder.

CHAS. A. ROUILLER.

**A new group of cyclopropane derivatives. II. Action of some analogs of the phenacyl halides on 3-acylcoumarins.** OSKAR WIDMAN. Univ. Upsala. *Ber.* 51, 907-11 (1918);

(1. *C. A.* 12, 2567.—*3-Acetyl-3,4-anisacylidenecoumarin*,  $\begin{array}{c} C_6H_4.CH \\ | \\ O.CO.CAc \end{array} \rangle CHCO_2C_6H_4OMe$ ,

from  $p-MeOC_6H_4COCH_2Cl$ , 3-acetylcoumarin and  $NaOEt$ , long needles, m.  $163^\circ$ , gives no  $FeCl_3$  reaction and does not reduce  $KMnO_4$  in  $Me_2CO$ . The alc. mother liquors from the coumarin on evapn. yield *ethyl α-acetyl-α,β-anisacylidenecoumarinate*,  $HOC_6H_4-CH.CH(COC_6H_4OMe).CAcCO_2Et$ , long 4-sided, flat prisms with 1 mol. solvent from

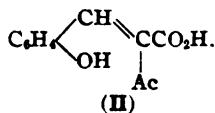
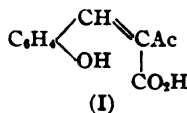
$C_6H_4$ , m. about  $70^\circ$ , resolidifies and m. again around  $90-116^\circ$ , loses its  $C_6H_4$  after several hrs. at  $75^\circ$  and then m.  $119-20^\circ$ , gives no  $FeCl_3$  reaction, gives a hard oil with boiling  $Ac_2O$ . *3-Benzoyl-3,4-anisacylidenecoumarin*, long prisms from  $AcOH$ , m.  $190^\circ$ . *Ethyl 3,4-anisacylidenecoumarin-3-carboxylate (a)*, prepd. in the usual way, prisms from alc., m.  $165-6^\circ$ , does not reduce  $KMnO_4$ . *β-Hydroxyphenyl-β-hydroxy-α-anisacylthane-α,α-dicarboxylic acid*,  $HOC_6H_4CH(OH)C(CO_2H)_2CH_2COC_6H_4OMe$ , obtained by shaking and gently warming the above ester with 4%  $NaOH$ , short prisms from  $AcOH$ , m.  $119-20^\circ$  (decompn.); the filtrate from this yields after some days *anisacylmalic acid*, needles, m.  $162^\circ$  (decompn.), gives no color with  $FeCl_3$ , also obtained from  $Na$  in alc.,  $CH_2(CO_2Et)_2$  and  $p-ClCH_2COC_6H_4OMe$  and long shaking of the resulting oil with 6%

KOH. Diethyl  $\alpha, \beta$ -anisacylidenesalicylidene-malonate,  $\text{HO} \cdot \text{C}_6\text{H}_4 \cdot \text{CH}(\text{CO} \cdot \text{C}_6\text{H}_4 \cdot \text{OMe}) \cdot \text{C}$ -

$(\text{CO}_2\text{Et})_2$ , crystals from MeOH, m.  $99-100^\circ$ , seps. from the alc. mother liquors obtained in the prepn. of (a); it does not reduce  $\text{KMnO}_4$  and gives no color with  $\text{FeCl}_3$ . 3-Acetyl-3,4-*o*-methoxyphenacylidene-coumarin, from 3-acetylcoumarin and *o*- $\text{ClCH}_2\text{CO} \cdot \text{C}_6\text{H}_4 \cdot \text{OMe}$ , prisms from alc., m.  $144-5^\circ$ , does not reduce  $\text{KMnO}_4$ . Ethyl 3,4-*m*-nitrophenacylidene-coumarin-3-carboxylate, from *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{COCH}_2\text{Br}$  and Et coumarin-3-carboxylate, prisms from AcOH, m.  $162-3^\circ$ , does not decolorize  $\text{KMnO}_4$ ; the mother liquors yield diethyl  $\alpha, \beta$ -*m*-nitrophenacylidenesalicylidene-malonate, crystals from alc., m.  $132-3^\circ$ . 3-Acetyl-3,4-naphthacylidene-coumarin, from 6.5 g.  $\alpha\text{-C}_{10}\text{H}_7\text{COCH}_2\text{Cl}$  (b<sub>18</sub>  $204-5^\circ$ , prepd. from  $\text{ClCH}_2\text{COCl}$  and  $\text{C}_{10}\text{H}_8$  in the presence of  $\text{AlCl}_3$  in  $\text{CS}_2$ ), 6 g. 3-acetylcoumarin and 0.734 g. Na in alc., prisms from AcOH, m.  $133-4^\circ$ , does not reduce  $\text{KMnO}_4$ ; yield, 4.2 g. III. Range and mechanism of the reaction of formation. Behavior of 3-acetylcoumarin towards alkali. *Ibid* 1210-4.—As shown in the earlier

papers, in the reaction  $\text{RCOCH}_2\text{Cl} + \text{C}_6\text{H}_4 \cdot \text{CH} : \text{CR}' \cdot \text{CO} \cdot \text{O} = \begin{array}{c} \text{C}_6\text{H}_4 \cdot \text{CH} \\ | \\ \text{O} \cdot \text{CO} \cdot \text{CR}' \end{array} \rangle \text{CHCOR} \text{ (a)}$

+HCl, R may be Ph, *p*- and *o*- $\text{MeOC}_6\text{H}_4$ ,  $\text{O}_2\text{NC}_6\text{H}_4$  and  $\text{C}_{10}\text{H}_7$  and R' may be Ac, EtCO, Bz,  $\text{CO}_2\text{Et}$ ,  $\text{CO}_2\text{Me}$  and CN. It has now been found that the reaction does not take place if R is Me and R' is Ph or H, moreover, that the coumarin ring is essential and that there must be an acyl,  $\text{CO}_2\text{R}$  or CN group in position 3 (R' in the above formula); neither di-Et fumarate,  $[(\text{EtO}_2)\text{CC}]_2$ ,  $\text{PhCH} : \text{CAcCO}_2\text{Et}$ ,  $\text{PhCH} : \text{C}(\text{CO}_2\text{Et})_2$ , *p*- $\text{MeOC}_6\text{H}_4\text{CH} : \text{CAcCO}_2\text{Et}$ , *o*- $\text{EtOC}_6\text{H}_4\text{CH} : \text{CAcCO}_2\text{Et}$  nor Et coumarin-4-carboxylate condenses with phenacyl halides in the presence of Na alcoholates. It has also been found that trimethylacetyl- and 3-benzoylcoumarin react towards alkalies just like 3-acetylcoumarin, i. e., if the yellow alk. soln. is neutralized the color disappears and the clear soln. deposits the original coumarin very slowly in the cold, quickly on warming or adding a mineral acid, but if the alk. soln. is warmed the color disappears and acids at once ppt. an acid stronger than the original coumarin. W. believes that cold NaOH forms at first an *o*-quinoid salt,  $\text{O} : \text{C}_6\text{H}_4 : \text{CHCAc} : \text{C}(\text{ONa})\text{OH}$ , which on acidification gives the colorless,  $\text{H}_2\text{O}$ -sol.  $\alpha$ -acetylcoumarinic acid (I), which is spontaneously transformed into acetylcoumarin, slowly in the cold but rapidly on warming or in the presence of strong acids, whereas if the alk. soln. is heated there is a steric rearrangement into  $\alpha$ -acetylcoumaric acid (II), which, as a  $\beta$ -ketonic acid, easily loses  $\text{CO}_2$  but cannot be converted into an anhydride. In alc. a similar *o*-quinoid addition product,  $\text{O} : \text{C}_6\text{H}_4 : \text{CHCAc} : \text{C}(\text{ONa})\text{OEt}$ , is formed. These, with reactive halogen compds., like the phenacyl halides, form compds. of the type  $\text{O} : \text{C}_6\text{H}_4 : \text{CHAc}(\text{CH}_2\text{Bz})\text{CO}_2\text{R}$  (R = H or Et) which rearrange into the cyclopropane deriv.  $\text{HO} \cdot \text{C}_6\text{H}_4 \cdot \text{CH} \cdot \text{CHBz} \cdot \text{CAcCO}_2\text{R}$  and finally (a).



CHAS. A. ROUILLER.

Simplified preparation of triaryltin halides. ERICH KRAUSE. Techn. Hochschule, Berlin. *Ber.* 51, 912-4 (1918).—In attempting to prep. triaryltin bromides by direct bromination of Sn tetraaryls it was found that even under the mildest conditions of bromination, such as in suspensions in indifferent solvents with the calcd. amt. of Br at the lowest possible temp. at which any reaction at all takes place, the chief product was always the dibromide with only a little monobromide while almost half of the the original material remained unchanged. These difficulties can be overcome, how-

ever, by brominating in  $C_6H_5N$ , 90-5% yields of monohalides being obtained in this way. The sepn. of the diaryl dibromide formed in small amt. can be easily effected by taking advantage of the fact that the triaryl hydroxide, unlike the diaryl dihydroxide, is easily sol. in  $Et_2O$ . Thus, 85.4 g.  $SnPh_4$  is dissolved in 700 cc. hot  $C_6H_5N$ , quickly cooled in ice with stirring, treated with 32 g. Br in 150 g.  $C_6H_5N$  at  $-48^\circ$  (cooled by addition of solid  $CO_2$ ) in 6 portions in the course of 2.5 hrs., distd. up to  $175^\circ$  (bath temp.), then for a short time *in vacuo* to remove  $PhBr$ , dissolved in  $Et_2O$ , shaken with dil. HCl, filtered, shaken twice with 30% NaOH, filtered, converted into the halide by treatment with HCl, HBr or HI and crystd. from  $Et_2O$ .  $Ph_3SnCl$  seps. in partly octahedral, partly prismatic crystals, m.  $106^\circ$ ,  $b_{111}$   $240^\circ$ . *Triphenyltin bromide*, columns or octahedrons, m.  $120.5^\circ$ ,  $b_{111}$   $249^\circ$ . *Iodide*, 4-sided monoclinic prisms, m.  $121^\circ$ ,  $b_{111}$   $253^\circ$ .

CHAS. A. ROUILLER.

**Quinoneimide dyes. X. Absorption spectra of the simplest triphenylmethane dyes.** F. KEHRMANN AND M. SANDOZ. Univ. Lausanne. *Ber.* 51, 915-22 (1918); cf. *C. A.* 12, 2565.—A table is given showing the absorption in the visible spectrum and the color tone of the different colored series of salts of  $Ph_3COH$ ,  $p\text{-}H_2NC_6H_4CPh_2OH$ ,  $(p\text{-}H_2NC_6H_4)_2CPhOH$  and  $(p\text{-}H_2NC_6H_4)_3COH$  on the one hand and of their *N*-dimethyl derivs. on the other. The yellow, most highly acid salts of all the dyes studied show practically the same absorption as that of  $Ph_3COH$  in concd.  $H_2SO_4$ , a one-sided extinction of the visible violet. In the Me derivs., as the result of the weak auxochromic action of the Me groups, the left limit is shifted somewhat towards the longer wave lengths and lies generally in the region  $\lambda_{480-490\mu}$ . Therefore all these salts must have a similar constitution, and especially the same chromophore, as the yellow  $Ph_3COH$  salts. The *p*-quinoneimide grouping,  $R_3C:C_6H_4:NH_2X$ , characteristic of the deeply colored salts can no longer be present in these cases; the auxochromic influence of the  $NH_2$  groups is almost entirely destroyed by their neutralization by the acid, and the structure  $R_3C(HX):C_6H_4:(NH_2)X$  is provisionally suggested. The methylated dyes give an ideal picture of the differing optical effect of salt formation on the chromophore, on the one hand, and on the auxochrome on the other; triacid crystal violet, diacid malachite green and monoacid dimethylaminofuchsimonium have almost identical orange-red colors with only a very slight shifting of the max. towards longer wave lengths with increasing Me content. The auxochrome influence of  $Me_2N$  groups seems to be almost destroyed by salt formation but not the influence of the chromophore. Similarly diacid crystal violet and monoacid malachite green are green-blue and only monoacid crystal violet is blue-violet. In the series of non-methylated dyes there are some irregularities which can, however, without exception, be explained by the fact that dil. solns. of these dyes generally represent equilibria markedly conditioned by temp., concn. and acid content. Thus, when a dil. aq. soln. of pararufuchsin is treated with a little HCl there appears first a red with much more bluish tinge, which may be called red-violet, resulting from the formation of the diacid salt, corresponding optically to monoacid Döbner violet; this color, however, fades out almost completely in a few min. with formation of the colorless carbinol salt; on warming the almost colorless soln. it again becomes intensely red-violet and once more fades away on cooling. If the red soln. is quickly treated with relatively much acid the violet-red color appears first and then an orange-yellow with more acid, the latter due to the triacid salt corresponding to monoacid fuchsimonium chloride, but this color also quickly disappears. If the acid content, however, surpasses a certain limit, a more or less intense yellow color persists, owing to the formation of a certain amt. of the tetra-acid salt, corresponding to  $Ph_3COH$  salts. Therefore, before making any measurements, it was necessary to det. empirically under what conditions solns. could be obtained which did not markedly change in tone for a few min. at least and could be characterized as optic-

ally homogeneous as possible. Triacid parafuchsin, diacid Döbner violet and monoacid fuchsimonium are almost identically orange-yellow with the max. of the broad main band lying between 480 and 485  $\mu\mu$ ; the soln. of the first also showed the band with a max. at  $\lambda$  585  $\mu\mu$  characteristic of the diacid salt. Monoacid Döbner violet and diacid parafuchsin are subjectively almost identically KMnO<sub>4</sub>-violet; here again, however, the parafuchsin soln. contains a mixt., for it also shows the band  $\lambda$  547  $\mu\mu$  characteristic of the monoacid salt. Comparison of the methylated and non-methylated dyes shows that the substitution of the amino H atoms by Me groups has a bathochromic effect and that in Döbner violet as in malachite green the entrance of a 2nd *p*-NH<sub>2</sub> group has a distinct hypsochromic effect. XI. Absorption spectra of some amino derivatives of naphthophenazonium. *Ibid* 923-8.—A table similar to that in the preceding paper is given. The 6-NH<sub>2</sub> deriv., both as base and as salt, exists only in the *p*-quinoid position of equil. The imide base is lemon-yellow and forms orange-yellow monoacid and dark blood-red diacid salts. The 3-NH<sub>2</sub> deriv., orange-yellow as imide base, forms fuchsin-red monoacid and green-blue diacid salts, all three *p*-quinoid. There also exists a blue-violet triacid salt whose absorption probably corresponds to that of the thus far unknown diacid naphthophenazonium and which is probably *o*-quinoid. The 3,6-(NH<sub>2</sub>)<sub>2</sub> deriv. is orange-yellow as imide base and forms blue-violet monoacid salts with red fluorescence, orange-yellow diacid and dark blood-red triacid salts; the tetra-acid salts are lacking. The diacid salts, however, do not correspond to the monoacid salts of the 3-NH<sub>2</sub> deriv., but are identical in color with the 6-NH<sub>2</sub> monoacid salts. Similarly the triacid salts correspond to the diacid 6-NH<sub>2</sub> and not the diacid 3-NH<sub>2</sub> salts. Therefore, in passing from the violet monoacid to the diacid di-NH<sub>2</sub> salt, the 2nd equiv. of acid neutralizes the 3-NH<sub>2</sub> group and destroys its optical effect; the 3rd equiv. of acid adds to the azine N. Investigation of Meldola blue showed that it behaves normally, *i. e.*, like a *N*-dimethyl deriv. of the 3-amine. In the ultra-violet alc. solns. of the monoacid salts of the monoamines show almost identical extinctions; the spectrum is characterized by 2 bands lying close together,  $\lambda$  265 and 285  $\mu\mu$ , almost coinciding in 1 case (275  $\mu\mu$ ) and another band at about 330  $\mu\mu$  (320  $\mu\mu$  in the case of the diamine).

CHAS. A. ROULLER.

*N*- and *O*-Methyl ethers of ketoximes. The four isomeric methyl ethers of *p*-tolylphenyl ketoxime. LEOPOLD SEMPER AND LEO LICHTENSTADT. Landw. Hochschule, Berlin. *Ber.* 51, 928-42 (1918); cf. Alessandri, *C. A.* 9, 1045.—When an aq. alc. alk. soln. of Ph<sub>2</sub>C:NOH is treated with Me<sub>2</sub>SO<sub>4</sub> (MeI gives poor yields) the isomeric *N*- and *O*-ethers are obtained in about equal amts. They are sepd. by means of cold petr. ether, b. 30-50°, in which the *N*-ether is very difficultly sol. and further by passing HCl into an Et<sub>2</sub>O soln., whereby only the HCl salt of the *N*-ether is pptd. If the methylation is not complete there is also formed an addition product of the *N*-ether with Ph<sub>2</sub>C:NOH, which is likewise insol. in cold petr. ether and small amts. of which render the purification of the ether very difficult. The *N*-ether seps. from ligroin in long needles, m. 102-3°, hydrolyzed by short warming with dil. acids or alkalis, forms with various substances *addition compounds* which are strongly dissociated in soln.; among these were isolated the following: with 0.5 mol. water, m. 78-80°; *benzophenone oxime*, m. 108-9°; 0.5 mol. *quinol*, m. 186-6.5°; *phenyl isocyanate*, m. 141-2°. From that with Ph<sub>2</sub>C:NOH the components can be isolated pure by alternate treatment with dil. alkalis and acids. The *O*-ether seps. from petr. ether in crystals m. 60-1°, decompd. only on long boiling with concd. acids, concd. H<sub>2</sub>SO<sub>4</sub> giving a mixt. of BzNHPh, BzOH, PhNH<sub>2</sub> and BzOEt while fuming HCl yields Ph<sub>2</sub>CO and NH<sub>2</sub>OMe.HCl, exclusively; the ether forms no addition compds. By fractionation of the mixt. of the  $\alpha$ - and  $\beta$ -oximes of *p*-MeC<sub>6</sub>H<sub>4</sub>COPh from dil. alc. instead of AcOH-H<sub>2</sub>O, the 2 forms were isolated in pure state, and while the  $\alpha$ -oxime was found to m. 153-4°, as given by Hantzsch

(Ber. 23, 2326(1890)), the  $\beta$ -oxime m. 136.5–7.5° and not 115–6°. The 2 oximes were methylated and the *O*- and *N*-ether of each stereomer was sepd. as described above, but owing to the additive power of the *N*-ethers they were generally obtained in the forms of addition products with the corresponding oxime, the cold aq. alc. alk. solns. of which were acidified with dil.  $\text{H}_2\text{SO}_4$ , whereupon only the oxime sepd. while the *N*-ether was obtained by treating the soln. with alkali and extg. with  $\text{Et}_2\text{O}$ . The  $\alpha$ -oxime *N*-ether seps. in tablets m. 91–2°, the *O*-ether in needles, m. 70.5–2.0°.  $\beta$ -Oxime *N*-ether, long prisms, m. 113–4°; *O*-ether, oil,  $b_{18}$  184–5°. The *N*-ethers are quant. hydrolyzed by boiling dil.  $\text{HCl}$  to  $\text{MeC}_6\text{H}_4\text{COPh}$  and  $\text{MeNHOH.HCl}$  and on reduction give a compd. whose hydrochloride,  $\text{C}_{15}\text{H}_{18}\text{NCl}$ , m. 199–201°. The following  $\alpha$ -oxime *N*-ether addition products were isolated: with 0.5 mol. water, m. 66–7.5°; *p*-tolyl phenyl  $\alpha$ -ketoxime, m. 106–7°; *p*-tolyl phenyl  $\beta$ -ketoxime, m. 90–2°.  $\beta$ -Oxime *N*-ether addition products with: *p*-tolyl phenyl  $\beta$ -ketoxime, m. 81–2°;  $\alpha$ -ketoxime, m. 124–5°. The *O*-ethers are insol. in dil. acids and not decompd. on warming and form no addition products. C. A. R.

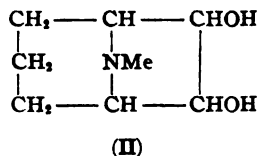
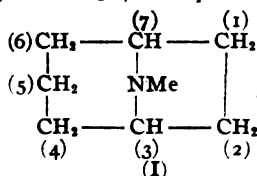
**Guvacine.** KARL FREUDENBERG. Univ. Kiel. Ber. 51, 976–82(1918); cf. Jahn, Arch. Pharm. 229, 669(1891).—A sample of Merck's guvacine (a), studied by F., showed no rotation in 10% aq. soln., gave a rust-red color with not too dil.  $\text{FeCl}_3$ , decompd. 285° (cor.) when rapidly heated (J., 271–2° (uncor.)), evolving vapors giving a strong pine splinter reaction; hydrochloride, decomp. 316°; chloroplatinate, decomp. 220–1°; chloroaurate, decomp. 197–9°. Contrary to J.'s statement, (a) can be esterified by using a sufficiently dil. soln. in  $\text{MeOH}$  (5 g. (a) in 100 cc.  $\text{MeOH}$  and 15 cc.  $\text{MeOH}$  satd. at 0° with  $\text{HCl}$ , boiled gently for 4 hrs.). The methyl ester hydrochloride, m. 121–2°, deliquesces in the air; chloroplatinate, silky, golden yellow leaflets, m. 211° (decompn.); free ester,  $b_{18}$  114°, solidifies 27°. When 4 g. of the ester in 5 cc.  $\text{MeOH}$  are allowed to stand 24 hrs. at 20° with 6 g.  $\text{MeI}$  in 5 cc.  $\text{MeOH}$ , then dild. with 30 cc.  $\text{EtOH}$ , 3 g. arecoline methiodide, m. 173–4°, crystals out; the mother liquor is concd. *in vacuo* and on treatment with alkali yields arecaidine,  $b_{18}$  104–12°; hydrochloride, decomp. 261°; chloroplatinate, decomp. 228–9°; chloroaurate, decomp. 198–9°. The above results show that (a) is identical with the tetrahydronicotinic acid,  $\text{CH}_2\text{NH.CH}_2\text{CH}_2\text{CH.CCO}_2\text{H}$ , obtained by Wohl and Losanitsch from imidodi-

propionacetal (C. A. 2, 839), and that J.'s arecaine is really arecaidine. *p*-Toluenesulfoguvacine, obtained in 4.3 g. yield from 2 g. (a) in 25 cc. of 2 *N*  $\text{NaOH}$  shaken 12 hrs. with 4.5 g. *p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ , plates from  $\text{C}_6\text{H}_6$ , m. 167–8°; 2 g. of this in 20 cc. of *N*  $\text{KOH}$  at –3° treated in the course of a few min. with 1.5 g. solid  $\text{KMnO}_4$ , then with 8–10 cc. of 40% aq.  $\text{NaHSO}_3$  and 25 cc. of 5 *N*  $\text{H}_2\text{SO}_4$ , gives 1.5 g. of *p*-toluenesulfodihydroxyimpecotinic acid, leaflets from  $\text{Me}_2\text{CO-H}_2\text{O}$ , m. 213–4°; 1 g. in 60 cc.  $\text{AcOH}$  and 3 cc.  $\text{H}_2\text{O}$  ozonized several hrs. at 18–20° gives 0.8 g. *N*-*p*-toluenesulfo- $\beta$ -propioiminoacetic acid,  $\text{HO}_2\text{CCH}_2\text{CH}_2\text{N}(\text{SO}_2\text{C}_6\text{H}_4\text{Me})\text{CH}_2\text{CO}_2\text{H}$ , prisms and plates from  $\text{H}_2\text{O}$ , m. 164°. The m. p. given above are cor. CHAS. A. ROUILLER.

**Guvacine methyl ester (guvacoline) and its natural occurrence.** KURT HESS. Univ. Freiburg i. B. Ber. 51, 1004–6(1918).—Crystals of a new prepn. from the betel nut supplied to H. by Merck yielded quant., on hydrolysis with  $\text{Ba}(\text{OH})_2$ , guvacine hydrobromide, needles, m. 280° (foaming), the natural product proving to be the  $\text{HBr}$  salt of the methyl ester, for which the name guvacoline is proposed. The hydrobromide, short prisms from  $\text{Me}_2\text{CO}$ , m. 144–5°, identical with the Merck product, was synthesized by boiling 2 g. guvacine 12 hrs. with 40 cc.  $\text{MeOH}$  satd. with  $\text{HCl}$ , evapg. *in vacuo* and rubbing with 25%  $\text{HBr}$ . CHAS. A. ROUILLER.

**Degradation of scopolone. III. Scopolone  $\rightarrow$  hydroscopolone  $\rightarrow$  tropan.** KURT HESS. Freiburg i. B. Ber. 51, 1007–15(1918); cf. C. A. 11, 964.—By a modification of the method earlier described (C. A. 10, 770), omitting the isolation of the

intermediate products, hyoscopoline (a) can be obtained with much greater ease: 10 g. scopoline (b) in 70 g. AcOH satd. at 0° with HBr is heated 6 hrs. at 125–30°, evapd. to dryness *in vacuo* at 40°, reduced with 24 g. Zn dust and 400 cc. of 20% H<sub>2</sub>SO<sub>4</sub> at 29–35°, heated 1 hr. on the H<sub>2</sub>O bath, filtered, neutralized with soda, evapd. to dryness *in vacuo* at 40°, extd. with abs. alc. in a Soxhlet, evapd., dissolved in 100 cc. H<sub>2</sub>O, made strongly alk. with solid NaOH and extd. 2–3 days with Et<sub>2</sub>O; yield, 9 g., m. 165°. When 1 g. (a) in 10 g. fuming HI is heated 5 hrs. at 195–205° with 4 g. PH<sub>4</sub>I and the combined products from 7 such operations are treated with 70 cc. H<sub>2</sub>O, decolorized with SO<sub>2</sub>, decanted from the red-brown insol. matter, concd. *in vacuo*, made alk., distd. with steam until the distillate is no longer alk. and the distillate is neutralized with N HCl (required, 14 cc., corresponding to a 25% yield) and evapd. *in vacuo* the residual sirup solidifies in a few days to needles, somewhat deliquescent in air of the HCl salt of tropin (I); chloroplatinate, orange needles, decomp. 229–30°; chloroaurate, prisms from H<sub>2</sub>O, m. 242–3° (decompn.); picrate, needles, m. 281° (decompn.). The alk. soln. remaining after removal of the (I) with steam yielded to Et<sub>2</sub>O 3.5–4.0 g. unchanged (a) out of the original 7 g. A product identical with (I) was obtained in 3.7 g. yield from 5 g. tropine, 5 g. PH<sub>4</sub>I and 25 g. fuming HI. These results establish that the structure of (a) is (II). The position of the two O atoms in (b) is not yet established; H. doubts the 1,2-ether structure proposed by Schmidt (C. A. 10, 1520), and believes the O bridge extends from C atom 2 to C atom 3, 4, 5, 6 or 7. When 8 g. hyoscopoline bromide-HBr is boiled 3.5 hrs. with 50 cc. concd. HCl it gives 5.6 g. of the chloride hydrochloride, C<sub>8</sub>H<sub>15</sub>O<sub>2</sub>NCl<sub>2</sub>, broad needles from alc., m. 289° (decompn.), converted quant. into (b) by treating with 25% NaOH and extg. with Et<sub>2</sub>O; attempts to oxidize it with CrO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub> gave only (b), while



Ag<sub>2</sub>O in H<sub>2</sub>O at 95° gave norscopoline. Nortropine with HI and PH<sub>4</sub>I gives nortropan (o. 8 g. from 1 g. nortropine). CHAS. A. ROUILLER.

Degradation of scopoline. ERNST SCHMIDT. Marburg. Ber. 51, 1281–3 (1918). —S. protests against the continued invasion of his field by Hess (preceding abstr.). CHAS. A. ROUILLER.

Reactions of tertiary amines and contribution to steric hindrance. Action of nitrous acid on methyl *p*-dimethylaminobenzoate and *p*-dimethylaminobenzaldehyde. FRANZ KLAUS AND OSKAR BAUDISCH. P. Beiersdorf & Co., Hamburg. Ber. 51, 1036–48 (1918); cf. C. A. 1, 730. —When 5 g. *p*-Me<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>Me in 40 cc. concd. HCl and 50 cc. H<sub>2</sub>O at –5° is slowly treated with 6 g. NaNO<sub>2</sub> in 12 cc. H<sub>2</sub>O and allowed to stand 0.5 hr., there is obtained 2 g. of a faintly yellow ppt. which, rubbed with 30 cc. of 1:2 HCl, filtered and crystd. twice from dil. alc. yields methyl *p*-methylnitrosaminobenzoate (a), MeN(NO)C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>Me, needles, m. 115.5°, easily sol. in concd. HCl, insol. in 1:2 HCl, not attacked by cold alkalies, easily dissolves on heating, gives the Liebermann reaction with PhOH-H<sub>2</sub>SO<sub>4</sub>. The filtrate from the crude (a), greatly dild. with H<sub>2</sub>O, gives a yellow ppt. which, after 2 crystns. from dil. EtOH and once from dil. MeOH, gives 2 g. 3,4-O<sub>2</sub>N(Me<sub>2</sub>N)C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>Me, m. 74°. From 1.9 g. (a) boiled 15 min. with 25 cc. of 2 N NaOH is obtained 1.4 g. MeN(NO)C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H. Boiled 5 min. with concd. HCl, (a) gives MeNHC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, while boiling 0.5 hr. with MeOH satd. with HCl gives *p*-MeNHC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>Me, m. 95.5° (Johnston.



C. A. 1, 812, gives 73–5°); it is also obtained from the acid or its HCl salt and from  $\text{MeN(NO)C}_6\text{H}_4\text{CO}_2\text{H}$  boiled with  $\text{MeOH-HCl}$ .  $p\text{-H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{Me}$  (10.5 g.) boiled 0.5 hr. with 35 cc. of 2 N NaOH and 8.5 g.  $\text{Me}_2\text{SO}_4$ , cooled, filtered, dissolved in 50 cc. concd. HCl and 50 cc.  $\text{H}_2\text{O}$  and treated at  $-5^\circ$  with 7.5 g.  $\text{NaNO}_2$  in 20 cc.  $\text{H}_2\text{O}$ , gives 5 g. (a). In the same way from the Et ester is obtained  $\text{MeN(NO)C}_6\text{H}_4\text{CO}_2\text{Et}$ , needles with faint straw-yellow luster from dil. alc., m.  $55.5^\circ$ , gives  $\text{MeNHC}_6\text{H}_4\text{CO}_2\text{H}$  with boiling concd. HCl. (a) is also obtained from  $\text{MeNHC}_6\text{H}_4\text{CO}_2\text{Me}$  and  $\text{NaNO}_2$  in 2 N HCl at  $-5^\circ$ .  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$  (10 g.) in 50 cc. concd. HCl and 20 cc.  $\text{H}_2\text{O}$  treated at  $-12^\circ$  with 14 g.  $\text{NaNO}_2$  in 25 cc.  $\text{H}_2\text{O}$  evolves NO abundantly and gives a yellow ppt. which, after rubbing with 35 cc. concd. HCl and crystg. from  $\text{H}_2\text{O}$ , yields the hydrochloride (b), S-yellow crystals, m.  $178^\circ$  (decompn.), of  $p\text{-ONC}_6\text{H}_4\text{NMe}_2$ , green crystals from  $\text{Et}_2\text{O}$ , m.  $82^\circ$ . The filtrate from the crude (b) treated with soda till still just acid gives a ppt. which, when again treated with 1:1 HCl and repeatedly crystd. from dil. alc., yields *p*-methylnitrosaminobenzaldehyde, faintly straw-yellow, m.  $78^\circ$ . A further amt. of this is obtained by adding 35 cc.  $\text{H}_2\text{O}$  to the concd. HCl ext. of the crude (b); the filtrate from this 2nd crop, when greatly dild. and rendered somewhat less acid with soda, gives a ppt. of  $3,4\text{-O}_2\text{N}(\text{Me}_2\text{N})\text{C}_6\text{H}_3\text{CHO}$ , m.  $105^\circ$ . Assuming that tertiary amines add  $\text{HNO}_2$  coordinately in the Bamberger (*Ber.* 30, 2175(1899)) and Karrer (*C. A.* 9, 3239) sense, they would form compds. of the type  $\text{RC}_6\text{H}_4\text{NMe}_2(\text{OH})\text{NO}$  which, if the *p*-position is not occupied, would yield *p*-NO derivs. If the *p*-position is occupied, as in the above cases, the reaction is entirely different; there is a partial dealkylation (formation of  $\text{RC}_6\text{H}_4\text{NMeNO}$ ) and a partial nitration (formation of  $p\text{-O-R}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{NMe}_2$ ), i. e., the *p*-substituent has the same influence as increase in the size of the alkyl groups in the *p*-unsubstituted compds. Just as a *p*-substituent influences the additive power ("ammonization") of the N atom, so inversely the "ammonization" of the N atom strongly influences the *p*-carbon atom; there is almost always to a certain extent an elimination of the *p*-substituent and its replacement by the NO or  $\text{NO}_2$  group. The attempt to bring the reactivity of the *p*-carbon atom into relation with the conjugated double bond which is present (Karrer) does not explain the non-reactivity of the amine oxides and *o*-methylated tert. amines, which also contain such a conjugated double bond; this lack of activity can be explained on the assumption of the valence-chemically satd. state of the N atom. This assumption does not harmonize with the space-filling explanation of steric hindrance and the Bamberger view of antireactive substituent influence is more satisfactory. CHAS. A. ROULLER.

**Amine oxides.** OSKAR BAUDISCH. Techn. Hochschule, Zürich. *Ber.* 51, 1048–58(1918).—When 50 g. finely powdered  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$  is slowly added to 430 cc. of a neutral soln. of  $\text{H}_2\text{SO}_4$  (417.2 cc. = 1 atom O), at  $0^\circ$ , filtered and allowed to stand overnight in the ice chest, there is obtained 45 g. of *p*-dimethylaminobenzoic acid *N*-oxide sulfate (a),  $(\text{HO}_2\text{CC}_6\text{H}_4\text{NMe}_2\text{:O}\dots\text{H})_2\text{SO}_4\cdot\text{H}_2\text{O}$ , long (2.5 cm.) feathery needles, m.  $160^\circ$  (foaming). Hydrochloride, obtained in 11 g. yield from 20 g. of (a) in 160 cc. HCl, needles, m.  $184^\circ$ ; 12 g. in 30 cc. hot  $\text{H}_2\text{O}$  treated with 60 g. KOAc in 50 cc.  $\text{H}_2\text{O}$  yields 3.8 g. of the free *N*-oxide, long (1 cm.) prismatic needles from  $\text{H}_2\text{O}$ , m.  $192.5^\circ$ . Chloroaurate,  $\text{HO}_2\text{CC}_6\text{H}_4\text{NMe}_2\text{:O}\cdot\text{HAuCl}_4$ , from (a) and 2 mols.  $\text{AuCl}_3$  in  $\text{H}_2\text{O}$ , red-yellow crystals from  $\text{H}_2\text{O}$ , m.  $136^\circ$ . Picrate, yellow needles from  $\text{H}_2\text{O}$ , m.  $155^\circ$ ; yield, 15.8 g. from 10 g. (a). Chloroplatinate, reddish white needles, m.  $155\text{--}6^\circ$ ; yield, 0.59 g. from 1.4 g. (a). Ferrocyanide, needles. When 3 g. of (a) in 50 cc. cold  $\text{H}_2\text{O}$  is satd. with  $\text{SO}_2$  there is pptd. 1.4 g. *p*-dimethylamino-*m*-sulfobenzoic acid, m.  $279\text{--}80^\circ$  (foaming), and the filtrate, freed from  $\text{SO}_2$  by boiling and satd. with NaOAc at  $0^\circ$ , yields 1.45 g.  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $242.5\text{--}3.5^\circ$ . The reaction probably follows the course: (a) +  $\text{H}_2\text{SO}_4 \rightarrow \text{HO}_2\text{CC}_6\text{H}_4\text{NMe}_2\text{:O}\dots\text{SO}_3\text{H} \rightarrow \text{HO}_2\text{CC}_6\text{H}_4\text{NMe}_2(\text{OH})\text{SO}_3\text{H} \rightarrow \text{HO}_2\text{CC}_6\text{H}_4\text{NMe}_2 + \text{HO}_2\text{CC}_6\text{H}_4(\text{SO}_3\text{H})\text{NMe}_2$ . Similarly, 10 g. (a) in 30 cc. concd.

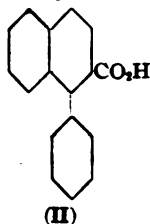
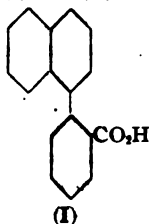
HCl and 300 cc.  $\text{H}_2\text{O}$  treated with 3.1 g.  $\text{NaNO}_2$  in 10 cc.  $\text{H}_2\text{O}$  gives 2.2 g.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{-NMe}_2$ , 4.8 g.  $3,4\text{-O}_2\text{N}(\text{Me}_2\text{N})\text{C}_6\text{H}_3\text{CO}_2\text{H}$  and 0.02 g.  $p\text{-ONC}_6\text{H}_4\text{NMe}_2$ . *m*-Amino-*p*-dimethylaminobenzoic acid hydrochloride, obtained in 2.8 g. yield from 4 g. of the  $\text{NO}_2$  acid reduced with  $\text{SnCl}_2$  in concd. HCl, long needles from alc., m.  $237^\circ$ , becomes faintly pink in the air, gives with a little  $\text{FeCl}_3$  a violet-red color; free acid, very faintly pink leaflets from ligroin, m.  $152\text{--}3^\circ$ . *p*-Diethylaminobenzoic acid *N*-oxide sulfate (b), obtained in 95 g. yield from 100 g.  $\text{Et}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$  and  $\text{H}_2\text{SO}_4$ , long needles with 1  $\text{H}_2\text{O}$ , m.  $173.5\text{--}4.5^\circ$ . Hydrochloride, needles from HCl, m.  $162.5\text{--}3.5^\circ$ . Free oxide, long needles from  $\text{H}_2\text{O}$ , m.  $170\text{--}1^\circ$  (foaming), loses AcH on dry heating. Chloroplatinate, reddish white needles, m.  $178^\circ$ . Chlorosaurate, golden yellow leaflets, m.  $177^\circ$ . Picrate, yellow needles, m.  $169\text{--}71^\circ$ . Ferrocyanide, leaflets turning green in the air. With  $\text{SO}_2$ , 5 g. (b) gives 3.1 g.  $\text{Et}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$  and 1.6 g.  $4,3\text{-Et}_2\text{N}(\text{HO}_2\text{S})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ ; with  $\text{HNO}_3$  are obtained  $p\text{-O}_2\text{NC}_6\text{H}_4\text{N}(\text{NO})\text{Et}$ , straw-yellow needles, m.  $119.5\text{--}20.0^\circ$ ,  $p\text{-EtN}(\text{NO})\text{C}_6\text{H}_4\text{CO}_2\text{H}$ , m.  $192\text{--}3^\circ$ ,  $3,4\text{-O}_2\text{N}(\text{Et}_2\text{N})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ , m.  $117^\circ$ ,  $3,4\text{-O}_2\text{N}(\text{EtNH})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ , m.  $239\text{--}40^\circ$ , and  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NEt}_2$ . CHAS. A. ROUVILLER.

*o*-Nitrosophenol. III. Preparation of *o*-nitrosophenol as a lecture experiment. OSKAR BAUDISCH. Ber. 51, 1058-9 (1918); cf. C. A. 10, 196.—A couple of crystals of  $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$  in a few drops hot glacial AcOH are dild., after cooling, with a little  $\text{H}_2\text{O}$ , covered with a layer of petr. ether and treated with vigorous shaking with a couple particles of Zn dust. The petr. ether layer becomes emerald-green, the aq. soln. reddish. If the green petr. ether soln. is added to a very little dil. aq.  $\text{CuSO}_4$  it becomes colorless and the Cu soln. deep red. The petr. ether solns. are stable for a long time and the test for Cu which can be made with them is more sensitive than the  $\text{K}_3\text{Fe}(\text{CN})_6$  test. CHAS. A. ROUVILLER.

Isovaleric acid and its abnormal behavior in the Perkin synthesis. ALFRED SCHAARSCHMIDT, E. GEORGEACOPOL AND JOHANN HERZENBERG. Techn. Hochschule, Berlin. Ber. 51, 1059-74 (1918).— $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H}$  (a), although it has a  $\text{CH}_3$  group adjacent to the  $\text{CO}_2\text{H}$ , gives, under the usual conditions of the Perkin synthesis, none of the unsatd. acid but only, with loss of  $\text{CO}_2$ , the unsatd. hydrocarbon. The elimination of  $\text{CO}_2$  is effected with remarkable ease and at very low temps. ( $70\text{--}80^\circ$ ). That the formation of unsatd. acid does not precede that of the hydrocarbon is shown by the fact that the unsatd. acid in the free state does not lose  $\text{CO}_2$  at  $100^\circ$ . Thus, 15 g.  $\text{BzH}$ , 50 g.  $(\text{Me}_2\text{CHCH}_2\text{CO})_2\text{O}$  (b) and 45 g.  $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{Na}$  (c) heated 30 hrs. at  $100\text{--}5^\circ$  give on steam distn. an oil which, when shaken with  $\text{NaHSO}_4$  and extd. with  $\text{Et}_2\text{O}$ , yields 9.3 g.  $\text{PhCH:CHCHMe}_2$  (d), b.  $195\text{--}200^\circ$ , while the residue in the distg. flask, on exact neutralization with HCl, slowly deposits in the cold 1.9 g.  $\alpha\text{-isopropylcinnamic acid}$  (e),  $\text{PhCH:C}(\text{CHMe}_2)\text{CO}_2\text{H}$ , leaflets or needles from very dil. alc., m.  $118.5^\circ$ . From 50 g.  $\text{BzH}$ , 175 g. (b) and 150 g. (c) heated 6 hrs. at  $150^\circ$  are obtained 46 g. (d); from 15 g.  $\text{BzH}$ , 55 g.  $\text{Ac}_2\text{O}$  and 45 g. (c) heated 30 hrs. at  $100\text{--}5^\circ$ , only 0.6 g. (d) and no (e); while from 15 g.  $\text{BzH}$ , 55 g. (b) and 45 g.  $\text{NaOAc}$  there were obtained 3.2 g. (d) and 11 g.  $\text{PhCH:CHCO}_2\text{H}$ . Furfural (50 g.), 175 g. (b) and 150 g. (c) after 5 hrs. at  $150^\circ$  give 32 g. furfuroisomylene,  $\alpha\text{-C}_6\text{H}_4\text{OCH:CHCHMe}_2$ , faintly yellowish oil, b.  $64\text{--}6^\circ$ , b.  $165\text{--}7^\circ$ , and 0.5 g. of the acid  $\text{C}_6\text{H}_4\text{OCH:C}(\text{CHMe}_2)\text{CO}_2\text{H}$ , scales from  $\text{H}_2\text{O}$ , m.  $114^\circ$ , sublimes easily, while 25 g. furfural, 75 g. (c) and 250 g.  $\text{Ac}_2\text{O}$  heated 7 hrs. at  $150^\circ$  give no hydrocarbon and 6 g.  $\text{C}_6\text{H}_4\text{OCH:CHCO}_2\text{H}$ , m.  $140^\circ$ .  $\text{O}_2\text{N-C}_6\text{H}_4\text{CHO}$ , (b) and (c), heated 10 hrs. at  $150\text{--}60^\circ$ , evolve no  $\text{CO}_2$  and form no unsatd. hydrocarbon; owing to the high temp. the reaction consists mainly in a resinification of the aldehyde. From 50 g.  $\text{O-HOC}_6\text{H}_4\text{CHO}$ , 90 g. (b) and 65 g. (c) after 20 hrs. at  $150\text{--}60^\circ$  are obtained 2.3 g. oil b.  $215\text{--}60^\circ$  and sepd. into 2 fractions, 0.9 g. b.  $215\text{--}30^\circ$  and 0.8 g. b.  $230\text{--}60^\circ$ , and only traces of an acid.  $p\text{-MeOC}_6\text{H}_4\text{CHO}$  (50 g.), 175 g. (b) and 150 g. (c) heated 8 hrs. at  $150\text{--}60^\circ$  yield 22 g.  $p\text{-MeOC}_6\text{H}_4\text{CH:CHCHMe}_2$ , b.

240–7°, and 3.1 g.  $\alpha$ -isopropyl-*p*-methoxycinnamic acid, needles from dil. alc., m. 134–5°. PhCH:CHCHO (15 g.), 50 g. (b) and 45 g. (c) heated 10 hrs. at 150–5° yield 2.2 g. oil b. 243–50°, 2 g. b. 250–7° and 1.5 g. of an acid, m. 145–7°. When Me<sub>3</sub>CHCHO, (b) and (c) are heated 36 hrs. at 150–60°, no unsatd. hydrocarbon or acid is formed; the only reaction consists in a polymerization of the aldehyde. CHAS. A. ROUVILLER.

A new benzanthrone synthesis. II. Conversion of 1-phenylnaphthalene-2,3-dicarboxylic anhydride into benzanthronecarboxylic acid. ALFRED SCHAARSCHMIDT AND ERNST KORTEN. Techn. Hochschule, Berlin. Ber. 51, 1074–82 (1918); cf. C. A. 11, 2797.—When 50 g. finely powdered 1,2,3-C<sub>10</sub>H<sub>6</sub>Ph(CO)<sub>2</sub>O are heated 3 hrs. at 155° with 750 g. of 91% H<sub>2</sub>SO<sub>4</sub>, poured into 3 l. H<sub>2</sub>O, heated to boiling and filtered hot, there is obtained 21.3 g. insol. material which, after treatment with alkali and 4 crystns. from PhNO<sub>2</sub>, yields 2.2 g. benzanthronecarboxylic acid (a), m. 347°. The filtrate, on cooling, deposits a *sulfoallochrysoketonecarboxylic acid* (b), C<sub>18</sub>H<sub>10</sub>O<sub>6</sub>S, in blood-red flocks, sol. in concd. H<sub>2</sub>SO<sub>4</sub> with red color but no fluorescence; *oxime*, lemon-yellow ppt., m. above 400°. Benzofluorenone (0.2 g.) heated in 10 cc. of 93% H<sub>2</sub>SO<sub>4</sub> 4 hrs. at 100° to appearance of the first distinct fluorescence, gives no ppt. on pouring into H<sub>2</sub>O, i. e., is completely converted into a sol. sulfonic acid; the same is true if it is heated 1 hr. at 100° or 1.5 hrs. at 50° while after 20 hrs. at room temp. the ketone is recovered unchanged. Allochrysoketonecarboxylic acid (c) treated with H<sub>2</sub>SO<sub>4</sub> at high temps. also gives (a) and (b). 1-Phenylnaphthalene-2,3-dicarboximide, obtained in 12.7 g. yield from 15 g. of the anhydride heated 1 hr. at 240–50° with NH<sub>3</sub> gas, thick needles from PhNO<sub>2</sub>, m. 249°; 1 g. heated 5 min. at 75° with 10 cc. of 93% H<sub>2</sub>SO<sub>4</sub>, gives (a), dark red flocks, and its orange-red *amide*, m. 281–2°. When 2.3 g. of the imide in 23 cc. concd. H<sub>2</sub>SO<sub>4</sub> is quickly heated to 130° (in the course of about 5 min.) and kept 5 min. more at this temp., it gives 0.8 g. benzanthronecarboxamide, m. 305°, 0.4 g. of a sulfonic acid difficultly sol. in cold H<sub>2</sub>O, and finally (c). III. ALFRED SCHAARSCHMIDT AND E. GEORGEACOPOL. Ibid 1082–7.—The method of prepn. of 3,4-benzofluorenone (allochrysoketone) (a) has been improved: 8 g. of the crystd. 1-carboxylic acid (allochrysoketonecarboxylic acid) is slowly heated above its m. p. in a 50 cc. retort at such a rate that the evolved CO<sub>2</sub> produces only a gentle foaming; when the mass becomes thick and the evolution of CO<sub>2</sub> slackens, the (a) is distd. over by rapid heating and crysts. in the neck of the retort to an orange mass; the whole operation lasts about 3 min. The product is rubbed with a little cold AcOH, washed with H<sub>2</sub>O, boiled with dil. NH<sub>4</sub>OH, filtered, washed and repeatedly crystd. from AcOH. When 5 g. (a) is gradually added to 40 g. molten KOH at 230–5° and stirred until a portion of the product dissolves completely in H<sub>2</sub>O (about 45 min.), cooled, dissolved in H<sub>2</sub>O, heated to boiling, nearly neutralized, filtered and acidified in the cold with dil. HCl there is pptd. a mixt. of the *acids* (I) and (II), sepd. by fractional crystn. from MeOH. The less sol.



acid (I) seps. in fine rhombohedrons, m. 161.5° (yield, about 1 g.); the isomer (1.2 g.) is very easily sol. in all solvents and without further purification was treated in 12 cc. C<sub>6</sub>H<sub>6</sub> with the calcd. amt. of PCl<sub>5</sub>, boiled 0.5 hr., cooled, slowly treated with 2.5 g. AlCl<sub>3</sub>, and heated 1 hr. at 60–5°; it gave the stable form of (a), m. 160°. The acid chloride of (I) with AlCl<sub>3</sub> gives benzanthrone; the latter is also obtained in 0.7 g. yield

from 0.8 g. *o*- $\alpha$ -C<sub>10</sub>H<sub>7</sub>C<sub>4</sub>H<sub>4</sub>CO<sub>2</sub>H converted into the chloride and treated with AlCl<sub>3</sub> as above, and in 0.9 g. yield by the dry distn. of the NH<sub>4</sub> salt of benzanthronecarboxylic acid.

CHAS. A. ROUILLET.

**Constitution of dioxalomalonic ester and other acylated acid esters.** KARL V. AUWERS AND ELISABETH AUFFENBERG. Marburg. *Ber.* 51, 1087-1106(1918); cf. *C. A.* 12, 693; Scholl and Egerer, *C. A.* 7, 2208.—v. A. and A., not agreeing with S. and E. that the fact that oxalomalonic esters lose CO on heating and do not instantly react with alk. KMnO<sub>4</sub> and undild. Br excludes the unsatd. structure RO<sub>2</sub>CC(O<sub>2</sub>CCO<sub>2</sub>R):C(CO<sub>2</sub>R)<sub>2</sub> and is compatible only with the pure ketone structure (RO<sub>2</sub>CCO)<sub>2</sub>C(CO<sub>2</sub>R)<sub>2</sub>, undertook to solve the question spectrochemically. They encountered two obstacles: (1) the difficulty in prepg. perfectly pure materials, and (2) compds. of such high mol. wt. and with so many groups containing O would have abnormally high mol. refractions even if they had the true dioxalomalonic ester structure. To det. the latter point, the following derivs. of CH(CO<sub>2</sub>H)<sub>3</sub> and C(CO<sub>2</sub>H)<sub>4</sub> of known structure were prepd. and their optical consts. detd.: CH(CO<sub>2</sub>Et)<sub>3</sub>, b<sub>14</sub> 139°, b<sub>15</sub> 145°, m. 27-9°, d<sub>4</sub><sup>20</sup> 1.104, n<sub>D</sub><sup>20</sup> 1.426, E<sub>Z</sub> 0.24, 0.21, 2%, 1% for  $\alpha$ , D,  $\beta$ — $\alpha$  and  $\gamma$ — $\alpha$  (unless otherwise stated, all the values for E<sub>Z</sub> are given in the above order). (MeO<sub>2</sub>C)<sub>2</sub>C(CO<sub>2</sub>Et)<sub>2</sub>, d<sub>4</sub><sup>20</sup> 1.180, n<sub>D</sub><sup>20</sup> 1.432, E<sub>Z</sub> 0.39, 0.40, 5%, 2%. C(CO<sub>2</sub>Et)<sub>4</sub>, b<sub>18</sub> 185°, d<sub>4</sub><sup>20</sup> 1.133, n<sub>D</sub><sup>20</sup> 1.434, E<sub>Z</sub> 0.36, 0.36, 3%, 4%. EtO<sub>2</sub>CCOC(CO<sub>2</sub>Et)<sub>2</sub>, b<sub>21</sub> 203°, d<sub>4</sub><sup>20</sup> 1.164, n<sub>D</sub><sup>20</sup> 1.438, E<sub>Z</sub> 0.48, 0.46, 7%. — The tricarboxylic ester, therefore, is alone optically normal while the refractive power of the compds. with 4 acid residues is distinctly increased; the values obtained, however, especially those for the dispersion, gave hope that the spectrochem. method could be applied to the problem under consideration. A prerequisite for obtaining pure tri-Et oxalomalonate (a) is the prepn. of its Na salt in pure form; the malonic ester and EtO<sub>2</sub>CCOCl must be specially purified; a com. sample of the latter, in spite of all possible attempts at purification, proved wholly unsuitable and success was attained only after it had been prepd. by the method of Anschütz and Schönfeld (*Ann.* 254, 20(1889)) or that of Diels and Nawiasky (*Ber.* 37, 3678(1904)). The free (a) was liberated from the Na salt with Et<sub>2</sub>O and ice-cold dil. H<sub>2</sub>SO<sub>4</sub> and purified according to the directions of S. and E.; as the oil cannot be distd. *in vacuo* dry air was passed through it under diminished pressure until the physical consts. did not change; it showed d<sub>4</sub><sup>20</sup> 1.153, n 1.44514, 1.44794, 1.45562, 1.46229 at 15.2° for  $\alpha$ , D,  $\beta$  and  $\gamma$ , n<sub>D</sub><sup>20</sup> 1.4458, E<sub>Z</sub> (calcd. on the basis of the ketone structure, EtO<sub>2</sub>CCOCH(CO<sub>2</sub>Et)<sub>2</sub>), 0.86, 0.89, 37%, 38%, E<sub>Z</sub> (on the basis of the enol structure, EtO<sub>2</sub>CC(OH):C(CO<sub>2</sub>Et)<sub>2</sub>), 0.47, 0.48, 25%, 27%; % enol by the Br titration method, 59.3-61.5. Tetra-Et dioxalomalonate (b), prepd. by S. and E.'s method except that an excess of the Na salt of (a) was used, which materially increased the yield and gave a pure product, showed d<sub>4</sub><sup>20</sup> 1.186, n<sub>D</sub><sup>20</sup> 1.455, n 1.45378, 1.45665, 1.46452, 1.47138 at 14.9° for  $\alpha$ , D,  $\beta$  and  $\gamma$ , E<sub>Z</sub> (on the basis of the ketone structure (EtO<sub>2</sub>CCO)<sub>2</sub>C(CO<sub>2</sub>Et)<sub>2</sub>), 1.14, 1.16, 36%, 35%, E<sub>Z</sub> (on the basis of the enol structure, EtO<sub>2</sub>CC(O<sub>2</sub>CCO<sub>2</sub>Et):C(CO<sub>2</sub>Et)<sub>2</sub>), 0.83, 0.84, 27%, 29%. The E<sub>Z</sub> values for MeC(OH):C(CO<sub>2</sub>Et)<sub>2</sub> (c) and MeC(OAc):C(CO<sub>2</sub>Et)<sub>2</sub> (d) are 0.44, 0.46, 28%, 31%, and 0.58, 0.59, 22%, 20%, resp. These values show that (a) and (c) are about equally enolized and that (b) is really an *O*-ester of (a) and should therefore more rationally be designated as triethyl ethoxalylloxethylene tricarboxylate. That the chem. behavior of (b) is not contrary to this structure was shown by a comparative study of the compds. MeC(O<sub>2</sub>CEt):CHCO<sub>2</sub>Et (e), (d), EtC(O<sub>2</sub>CEt):C(CO<sub>2</sub>Et)<sub>2</sub> (f), (b), EtO<sub>2</sub>CCOC(CO<sub>2</sub>Et)<sub>2</sub> (g) and C(CO<sub>2</sub>Et)<sub>2</sub> (h). About 0.25 cc. of each was shaken under as nearly identical conditions as possible with ice-cold 1% KMnO<sub>4</sub> and soda; with (e) the color disappeared immediately, with (d) somewhat more slowly, with (f) after about 0.25 min., with (b) after a somewhat longer interval, with (g) after about a min., while with (h) it persisted quite a long time. The

reaction can therefore be considered a criterion of unsatn. only at the two extremes of the series; for the intermediate members it is doubtful whether the gradual decolorization is due to a sterically delayed addition reaction of an unsatd. compd. or to the incipient hydrolysis of a satd. compd. Similar, though less marked, differences were observed when Br was dropped into the first 4 of the above compds. at  $-10^\circ$ . Neither the  $\text{KMnO}_4$  nor the Br reaction, therefore, yields decisive evidence as to the structure of (b). Also, the present work shows that not only ketones but enols also may lose CO at high temps. The formation of not quite pure propionyl- and acetylphenylhydrazine by the action of  $\text{PhNHNH}_2$  on the propionyl ester of acetylmalonic ester and the isomeric Ac ester of propionylmalonic ester, resp., had been ascribed formerly to the possible presence in the malonic ester of small amts. of the true diacyl derivs., although it was considered more probable that the formation of the by-products was due to a more deep-seated decompn. The latter assumption has been verified, as pure acetylmalonic ester in ice-cold soln. gives some acetylphenylhydrazine, the ester being decompd. by  $\text{PhNHNH}_2$  just as it is by alkalis, although more slowly. Similarly propionylmalonic ester (1 g.) gives a little (0.15 g.) propionylphenylhydrazine. As S. and E. likewise deduced the constitutions of their acylmethanetricarboxylic esters from their behavior towards  $\text{KMnO}_4$  and Br, v. A. and A. have studied a representative of this class of compds. by the spectrochem. method. Tri-Et acylmethanetricarboxylate (i),  $b_{11}$  153-5°,  $d_4^{20}$  1.121,  $n_D^{20}$  showed 1.433,  $E\epsilon$  0.37, 0.36, 5%, 4% (on the basis of the ketone structure), indicating beyond doubt that it really is the satd. Ac deriv. According to Claisen's views, starting from malonic ester, a pure C-deriv. or pure O-ester can be obtained at will by the introduction of a  $\text{CO}_2\text{Et}$  and an acyl group according to the order in which the 2 groups are introduced:  $\text{CH}_2(\text{CO}_2\text{Et})_2 \rightarrow \text{AcCH}(\text{CO}_2\text{Et})_2 \rightarrow \text{MeC}(\text{OH})\text{:C}(\text{CO}_2\text{Et})_2 \rightarrow \text{MeC}(\text{OCO}_2\text{Et})\text{:C}(\text{CO}_2\text{Et})_2$ , and  $\text{CH}_2(\text{CO}_2\text{Et})_2 \rightarrow \text{CH}(\text{CO}_2\text{Et})_2 \rightarrow \text{AcC}(\text{CO}_2\text{Et})_2$ , and as a matter of fact it was found that the product obtained by treating di-Et acetylmalonate with  $\text{ClCO}_2\text{Et}$  under various conditions (as the Na salt in  $\text{Et}_2\text{O}$ , the Cu salt in  $\text{C}_6\text{H}_6$  suspension, and finally in  $\text{C}_6\text{H}_5\text{N}$ ) was not identical with (i) but was the isomeric diethyl o-carbethoxyethylidene-malonate,  $b_{11}$  166°,  $d_4^{20}$  1.127,  $n_D^{20}$  1.448,  $E\epsilon$  (on the basis of the enol structure), 0.50, 0.51, 19%, 19%.

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**Constitution of phthalyl- and succinylmalonic ester.** KARL V. AUWERS AND ELISABETH AUFFENBERG. Marburg. *Ber.* 51, 1106-15 (1918); cf. preceding abstr. —In order to det. between the sym. and unsym. structures of phthalylmalonic ester (a) its optical consts. have been detd. and compared with those of 2,2-diethylindandione (b) and 4,7-dimethyl-2,2-diethylindandione (c). (a) m. 74-5°,  $d_4^{24.4}$  1.1887,  $n$  1.53416, 1.54105, 1.56155 for  $\alpha$ , D and  $\beta$  at 84.4°,  $E\epsilon$  (on the basis of the sym. formula) 2.52, 2.66, 137%,  $E\epsilon$  (on the basis of the unsym. formula) 2.13, 2.25, 122%, for  $\alpha$ , D and  $\beta - \alpha$ . (b) (still containing 2% Cl),  $b_{11}$  157-9°,  $d_4^{14.6}$  1.0693,  $n_D^{20}$  1.5393,  $E\epsilon$  1.43, 1.49, 54%, 37% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ . (c), m. 51-2°,  $b_{11}$  153°,  $d_4^{22.4}$  1.0174,  $E\epsilon$  1.56, 1.63, 63% for  $\alpha$ , D and  $\beta - \alpha$ . These results show that (a) has a spectrochem. character entirely different from that of (b) and (c) and therefore has not the sym. structure. As an unsym. compd. it may perhaps be compared with benzalmalonic ester, for which  $E\epsilon$  is 1.62, 1.73, 90%, 101% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ ; in comparing (a) and (d) it should be remembered that (a) contains a conjugation as well as a disturbance ("Störung") more than (d), the one tending to increase, the other to decrease the exaltations. Moreover, aromatic bicyclic ketones (as shown in the case of (b) and (c)) have higher exaltations than monocyclic ketones of analogous structure. Finally the optical consts. of the solid (a) had to be detd. at a high temp. (84.4°), which would also increase the exaltations. The numerical magnitude of all these factors cannot be forecast with certainty and it can only be said that the results indicate

similarity of structure between (a) and (d). To test this point further it would have been desirable to compare  $\text{PhCH:CH}_2$  and  $\text{C}_6\text{H}_4\text{C}(\text{:CHMe})\text{O.CO}$  (e), which stand to

each other in the same relation as (a) and (d), but (e) at temps. above its m. p. polymerizes in a few moments to an exceedingly viscous mass so that no exact detns. could be made. Nevertheless it was established that (e) has considerably higher refractive and dispersive powers than  $\text{PhCH:CH}_2$ .  $\text{C}_6\text{H}_4\text{C}(\text{:CHMe})\text{O.CO}$ , m.  $64^\circ$ ,  $d_4^{20}$  1.1053, shows  $EZ$

2.29 and 2.36 for  $\alpha$  and D, and  $\text{PhCH:CHMe}$  shows 1.09 and 1.19, the lactone ring, therefore, producing a powerful increase in the exaltations. The optical consts. of (a) do not wholly exclude the structure  $\text{C}_6\text{H}_4\text{CO.C(CO}_2\text{Et):C(OEt).O.CO}$ , considered by

Scheiber (*C. A.* 6, 2077), but this has but slight probability on chem. grounds. Succinylmalonic ester, m.  $68^\circ$ ,  $d_4^{24}$  1.1684, shows  $EZ$  1.60, 1.63, 58%, 57% on the basis of the sym. structure and 1.13, 1.15, 41%, 42% on the basis of the unsym. structure; the high exaltations exclude the sym. structure with certainty. The compd. obtained from this ester and  $\text{PhNHNH}_2$  has the compn.  $\text{C}_{21}\text{H}_{22}\text{O}_4\text{N}_4$  and not  $\text{C}_{21}\text{H}_{20}\text{O}_4\text{N}_4$  as originally given by Scheiber (who subsequently corrected his earlier statement; *C. A.* 5, 3815). As in the case of (a) the optical data do not exclude the structure  $\text{O.CO.CH}_2\text{CH}_2\text{CO.C(CO}_2\text{Et):COEt}$ .

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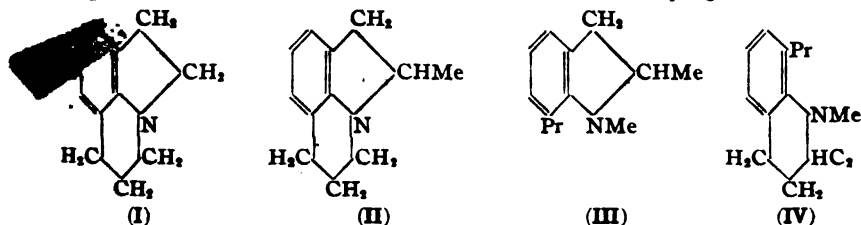
**Spectrochemical communications. I. Polyketo compounds. K. v. AUWERS.** Marburg. *Ber.* 51, 1116-24(1918).—In connection with the study of dioxalomalonic ester (first of the 2 preceding abstrs.) it became necessary to det. whether in a compd. of the type  $(\text{EtO}_2\text{CCO})_2\text{C(CO}_2\text{Et})_2$  exaltations of the specific refraction and dispersion were to be expected, and if so, of what magnitude, as such a compd. contains the doubly disturbed ("gestörte") conjugation  $\text{EtOC(:O)C(:O)OEt}$ .  $\text{Ac}_2$ ,  $d_4^{13.46}$  0.9809, showed  $EZ$  0.42, 0.41, 9% for  $\alpha$ , D and  $\beta - \alpha$ ;  $(\text{CO}_2\text{Et})_2$ ,  $d_4^{15.76}$  1.0834, gave 0.27, 0.27, 4%, 4% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ . Thus,  $\text{Ac}_2$ , with the less disturbing Me groups, shows distinct exaltations, while in  $(\text{CO}_2\text{Et})_2$ , with the more strongly disturbing OEt groups, the anomaly due to the 2 conjugated C:O groups almost disappears. Even assuming that in a C,C-dioxalomalonic ester the optical effect of the 2 conjugated groups is doubled, which by analogy is not probable, this would not suffice to explain the great exaltations (especially of the dispersion—about 28%) actually found, thus further confirming the view that the compd. is an unsatd. O-ester. To det. the spectrochem. influence of 3 and 4 adjacent C:O groups, the 3 following compds. were studied:  $\text{AcCOCO}_2\text{Et}$ ,  $b_{11}$  77-80°,  $d_4^{15.8}$  1.1289,  $EZ$  0.60, 0.60 for  $\alpha$  and D;  $\text{CO(CO}_2\text{Et})_2$ ,  $b_{11}$  105-7°,  $d_4^{15.8}$  1.1419,  $EZ$  0.57, 0.56, 10% for  $\alpha$ , D and  $\beta - \alpha$ ;  $(\text{COCO}_2\text{Et})_2$ ,  $b_{11}$  120-2°,  $d_4^{16.9}$  1.1845,  $EZ$  0.68, 0.68 for  $\alpha$  and D (the d. and  $n$  increase somewhat and the color deepens after each distn.). These detns. are somewhat uncertain as these compds. are all very hygroscopic and do not distil entirely undecompd. *in vacuo*, but the influence of the 3rd and 4th C:O groups is unmistakable. The effect of a C:O group adjacent to a conjugation —C:C:O already present is similar;  $\text{PhAc}$  (*C. A.* 7, 480),  $EZ$  0.60, 0.65 for  $\alpha$  and D;  $\text{BzAc}$ ,  $b_{11}$  101.6-2.6°,  $d_4^{15.8}$  1.1083,  $EZ$  1.01, 1.05;  $\text{BzCOAc}$ ,  $d_4^{17.2}$  1.1801,  $EZ$  1.37, 1.45 (the triketone is very hygroscopic and the detns. are not very certain). As the 2 polyketones are so colored that the dispersion could not be measured, the following compds. were also compared: 5,2-Me(MeO) $\text{C}_6\text{H}_2\text{COAc}$ ,  $EZ$  0.94, 54% for  $\alpha$ , D and  $\beta - \alpha$ ; 5,2-Me(MeO) $\text{C}_6\text{H}_2\text{COAc}$ , m. 60-1°,  $d_4^{16}$  1.1193,  $EZ$  1.27, 1.35, 80%; methyl-p-cresyl diketone ethyl ether, 5,2-Me(EtO) $\text{C}_6\text{H}_2\text{COAc}$ , prisms from MeOH or ligroin, m. 63-4°,  $d_4^{15}$  1.0524,  $EZ$  1.46, 1.53, 78%, prepd. from o-propionyl-p-cresyl ethyl ether (from the cresol and alk.  $\text{Et}_3\text{SO}_4$ ), prisms from MeOH, m. 50-1°, through the oxime, needles from dil. MeOH, m. 105-6°. Finally,  $\text{BzCO}_2\text{Et}$ ,  $b_{11}$  128-31°.

$b_m$  158–63°,  $d_4^{13.35}$  1.1255,  $EZ$  0.89, 0.84, 46%, 52% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ , may be compared with  $BzCHMe_3$ ,  $EZ$  0.51, 0.53, 28%, 31%, and  $BzOEt$ ,  $EZ$  0.43, 0.49, 26%, 26%. II. Allenes and ketenes. *Ibid* 1124–8.—Contrary to Brühl (*C. A.* 1, 1537) and in agreement with Merezhkovskii (*C. A.* 8, 1420) it has been found that compds. with cumulated double bonds between C atoms are not spectrochemically normal but show moderate exaltations in refraction and dispersion which, however, are much smaller than in compds. with conjugated double bonds. Thus  $Me_2C:C:CH_3$ ,  $b$  39–40.5°,  $d_4^{13.6}$  0.6913, shows  $EZ$  0.60, 0.59, 21%, 18% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ . On the other hand, the cumulation  $-C:\dot{C}:O$  exerts no marked spectrochem. influence as shown in the comparison of  $Ph_3C:C:O$ ,  $d_4^{13.7}$  1.1107,  $EZ$  0.86, 0.92 for  $\alpha$  and D, with  $Ph_3C:O$ ,  $EZ$  0.91, 1.00, and  $Ph_3C:CH_3$ ,  $EZ$  0.88, 0.95, and in the values for  $Et_3C:-C:O$ ,  $b$  88–9.5°,  $d_4^{13.55}$  0.8366, for which  $EZ$  is —0.08, —0.09, —2% for  $\alpha$ , D and  $\beta - \alpha$ . The values for the polymer of the last compd.,  $Et_3C.CO.CEt_3.CO$ ,  $b_m$  115–7°,  $b$  230°,

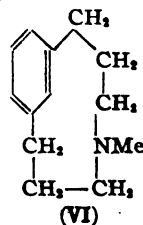
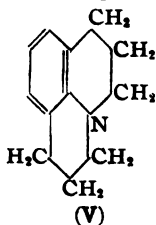
$d_4^{16.65}$  0.9463,  $EZ$  0.27, 0.25, 4%, 1% for  $\alpha$ , D,  $\beta - \alpha$  and  $\gamma - \alpha$ , are about normal, the 4-membered ring producing a slight exaltation, perhaps somewhat increased by the two C-O groups, while the two *gem*- $Et_3$  groups exert an influence in the opposite direction. III. Spectrochemical technic. *Ibid* 1128–33.—In detg. the  $d$ . in the molten state of high melting substances v. A. uses an Ostwald pycnometer, one capillary of which is provided with a mm. scale instead of a single mark. The molten substance having been heated more or less (depending on the size of the pycnometer) above the temp. at which the detn. is to be made, it is drawn into the pycnometer which is then suspended in a bath of glycerol or other high boiling solvent heated approximately to the desired temp. When the liquid in the graduated capillary becomes stationary, which it does very quickly, its position is read with a lens. The pycnometer is calibrated in the usual way. Detns. accurate to within 1 or 2 units in the 4th decimal place can be made with a pycnometer of 0.5 cc. capacity. Of course, at high temps. there is an unavoidable error owing to the fact that the portion of the liquid in the arm of the pycnometer projecting outside of the bath is somewhat cooler than the main portion; it was found that under the most unfavorable conditions (*i. e.*, when the vol. of liquid not immersed in the bath was about 10% of the total vol.) at temps. of about 80° with substances having a  $d$ . of about 1, the error was about 2 units in the 3rd decimal place.

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**Bases of the julolidine type.** J. v. BRAUN, KARL HEIDER AND WANDA WYCZATKOWSKA. Univ. Breslau and Warschau. *Ber.* 51, 1215–27(1918); cf. *C. A.* 11, 806, 2785.—*Lilolidine* (I), obtained in 40% yield from dihydroindole gently boiled 18 hrs. with 6 parts  $ClCH_2CH_2CH_2Br$  (a), treated with HCl, freed from unchanged (a) with steam, made alk. and again distd. with steam,  $b_m$  156°, becomes reddish in the air; *picrate*,  $m$ . 138°; *methiodide*. With  $BzH$  in the presence of  $ZnCl_2$  (I) condenses almost as easily as  $PhNMe_3$  and on short warming with chloranil develops an intense malachite-green color; with 0.5 mol.  $HCHO$  on the  $H_2O$  bath it gives a thick, oily base not volatile with steam, recognized as the  $CH_3Ph_3$  deriv.  $CH_3(C_{11}H_{13}N)_3$ , by the blue-violet color produced with  $PbO_2$ . When the methiodide is converted by  $AgCl$  into the chloro-



methylate and the concd. soln. of the latter is treated with twice the calcd. amt. of 5% Na-Hg, it gives (I) exclusively; the simultaneous attachment of the pyrrolidine and piperidine rings to the  $C_6H_4$  nucleus, therefore, markedly increases its stability, Na-Hg merely splitting off the Me group of the chloromethylate.  $\alpha$ -Methyldihydroindole gently boiled 4-5 hrs. with 5-6 parts (a) gives a brown-red cryst. magma consisting chiefly of *N*- $\gamma$ -chloropropyl- $\alpha$ -methyldihydroindole hydrobromide which, on acidification, extn. with  $Et_2O$  to remove the excess of (a), treatment with alkali and distn. with steam, yields the free base,  $b_{18}$  172-5°, faintly yellow liquid changing with extraordinary rapidity, becoming dark, then turbid and depositing a solid. If the heating with (a) is continued 18 hrs. the product is  $\alpha'$ -methyllulolidine (II) (yield, 40%).  $b_{18}$  165-7°, soon darkening; *picrate*, m. 140°; *methiodide*, m. 202°. Towards BzH and HCHO, (II) behaves like (I) and with  $FeCl_3$  and other oxidizing agents gives the red color characteristic of the ring-homolog julolidine. When the chloromethylate is treated in the usual way with Na-Hg and the resulting basic reduction product is heated 15 hrs. in HCl with 0.5 mol. HCHO, made alk. and distd., only about 10% passes over as *o*-propyl- $\alpha$ ,*N*-dimethyldihydroindole (III),  $b_{18}$  151°; *picrate*, yellow needles from alc., m. 121°; *chloroplatinate*, yellow-red, m. 177-8°; *methiodide*, oily. (III) is perfectly stable, does not darken even after weeks, gives no red color with oxidizing agents and no malachite-green color on treatment with BzH and subsequent oxidation, only a violet color resulting after long treatment with the BzH; that the N is still in aromatic combination as in (II) is shown by nitrating in excess of  $H_2SO_4$ ; on making alk. with soda a  $NO_2$  deriv. with the  $NO_2$  group in the *m*-position to the basic N seps. as a red-brown oil; this on reduction with  $SnCl_2$  gives the solid HCl salt of a base showing the typical reactions of a *m*-diamine (intense red color with  $HNO_3$ , beautiful toluylene-blue and -red reaction with  $ONC_4H_9NMe_2$ ). The structure (III) is further confirmed by the fact that the compd. is not identical with *o*-propylkairoline (IV), which was synthesized by heating *o*- $PrC_6H_4NH_2$  in  $H_2SO_4$  with glycerol and  $H_3AsO_4$  3 hrs., making alk., distg. with steam and diazotizing; the resulting *o*-propylquinoline, light yellow liquid,  $b_{18}$  142° (yield, 35%); *chloroplatinate*, m. 196°; *picrate*, yellow-red needles from alc., m. 142°; *methiodide*, m. 136°. Reduction of the methiodide with Sn and HCl gives (IV) which shows a faint but distinct fluorescence in  $Et_2O$ ; *picrate*, deep red, m. 108-9°; *chloroplatinate*, deep red cryst. powder, m. 164°. Julolidine (V) (Pinkus, *Ber.* 25, 2798



(1892)), obtained pure in almost theoretical yield by heating tetrahydroquinoline and (a) 8 hrs. instead of 1.25 hrs. as given by P.,  $b_{17}$  155-6°, without decompn., easily gives with BzH the malachite-green reaction; heated 15 hrs. with 0.5 mol. HCHO it forms an oily diphenylmethane deriv., which with excess of MeI, however, yields a cryst. *dimethiodide*,  $C_{27}H_{28}N_2I_2$ , m. 228°. Equal parts of (V) and MeI after 8 hrs. at room temp. give 16% methiodide; the corresponding quaternary hydroxide on distn. (best *in vacuo*) loses MeOH and regenerates pure (V). When the chloromethylate in concd. soln. is treated with twice the calcd. amt. of 5% Na-Hg there is obtained 80% of a basic mixt. consisting of 63% (V) and 37% of a base to which is assigned the unusual structure (VI); (VI) is isolated from the mixt. by the HCHO method and forms an almost colorless liquid of faint odor,  $b_{22}$  144-8°; *picrate*, yellow needles from alc., begins to



decomp. above  $180^{\circ}$ , m.  $189^{\circ}$ ; chloroplatinate, m.  $191^{\circ}$ ; methiodide, m.  $200^{\circ}$ . (VI) gives no trace of color with oxidizing agents, does not condense with BzH to a malachite green-like dye, is unstable towards  $\text{KMnO}_4$  in  $\text{H}_2\text{SO}_4$  but does not take up a trace of H on shaking with Pd. Treated with the amt. of  $\text{KMnO}_4$  calcd. for the destruction of the complex  $\text{C}_7\text{H}_{12}\text{N}$  it gave a small amount of an acid which, from its soly., m. p. (above  $300^{\circ}$ ) and long hair-like crystals, was identified, with reasonable certainty, as  $m\text{-C}_6\text{H}_4(\text{CO}_2\text{H})_2$ . Nitration in  $\text{H}_2\text{SO}_4$  gives an oily  $\text{NO}_2$  deriv. which on reduction yields no product showing in the slightest degree the reactions of a  $m$ -diamine. The quaternary hydroxide (from the methiodide) on distn. does not lose MeOH but  $\text{H}_2\text{O}$  and yields a base  $\text{C}_{14}\text{H}_{22}\text{N}$ , b.  $117-8^{\circ}$ , b.  $164-70^{\circ}$ , which soon becomes red-brown; the hydrochloride, picrate, chloroplatinate and methiodide are all oily. The base has a marked aliphatic odor, immediately decolorizes  $\text{KMnO}_4$  in  $\text{H}_2\text{SO}_4$  at  $0^{\circ}$  and absorbs H in the presence of Pd. It is provisionally assigned the structure of  $\gamma$ - $m$ -allylphenylpropyldimethylamine,  $\text{CH}_2\text{:CHCH}_3\text{C}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CH}_2\text{NMe}_2$ .

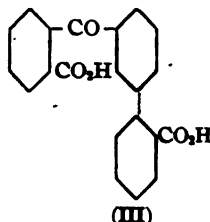
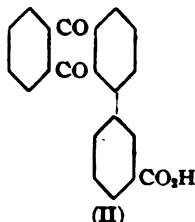
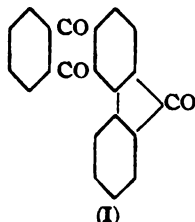
CHAS. A. ROUILLER.

**Rearrangement of arylhydroxylamines into aminophenols.** F. KLAUS AND O. BAUDISCH. *Ber.* 51, 1228-30(1918).—From 3 g.  $m\text{-Me}(p\text{-MeC}_6\text{H}_4\text{SO}_2)\text{NC}_6\text{H}_4\text{NHOH}$  slowly added with vigorous stirring to 17 g. concd.  $\text{H}_2\text{SO}_4$  and 60 g. ice, then dild. with 175 cc.  $\text{H}_2\text{O}$ , heated 30 min. on the  $\text{H}_2\text{O}$  bath, then 15 min. over a free flame, filtered when the  $\text{NH}_2\text{OH}$  reaction (red color imparted to the  $\text{Et}_2\text{O}$  when 1-2 cc. of the soln. is shaken under  $\text{Et}_2\text{O}$  with 1 drop each of  $\text{FeCl}_3$  and  $\text{NaNO}_2$ ) is no longer given, partly neutralized with soda and treated with  $\text{NaOAc}$ , is obtained  $p$ -amino-[methyl- $p$ -toluene sulfonylamino]phenol,  $\text{H}_2\text{N}(\text{MeC}_6\text{H}_4\text{SO}_2\text{NMe})\text{C}_6\text{H}_4\text{OH}$ , m.  $163-4^{\circ}$ , easily sol. in dil. acids, gives an intense violet color with  $\text{FeCl}_3$ , reduces  $\text{NH}_4\text{-AgNO}_3$  energetically, couples with phenols after diazotization. Similarly from  $o$ , $p$ - $\text{MeC}_6\text{H}_4\text{SO}_2\text{C}_6\text{H}_4\text{NHOH}$  is obtained 2-amino-5-hydroxyphenyl  $p$ -toluenesulfonate sulfate, m.  $162^{\circ}$ ; hydrochloride, needles from alc.- $\text{Et}_2\text{O}$ , m.  $187-90^{\circ}$ . The base couples, after diazotization, with  $\beta$ -naphthol, forming a dark red dye.

CHAS. A. ROUILLER.

**Rearrangement reactions in the anthraquinone-fluorenone series.** ALFRED SCHAARSCHMIDT AND JOHANN HERZENBERG. *Techn. Hochschule, Berlin. Ber.* 51, 1230-7(1918); cf. *C. A.* 11, 2797.—1-Chloro-2-benzoylanthraquinone (a), yellow leaflets from AcOH, m.  $196^{\circ}$ , is obtained in 12 g. yield from 16.5 g.  $1,2\text{-C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4\text{ClCO}_2\text{H}$  by boiling 1 hr. in 90 cc. PhMe with 16 g.  $\text{PCl}_5$ , suspending the resulting chloride (15 g. light yellow needles) in 100 cc.  $\text{C}_6\text{H}_6$ , adding 16 g.  $\text{AlCl}_3$  in the course of 45 min. with shaking, heating 4 hrs. at  $60^{\circ}$ , decomp. with ice, removing the  $\text{C}_6\text{H}_6$  with steam and boiling the crude ketone with HCl and then with dil. soda. Heated 5 hrs. at  $170-3^{\circ}$  with 50 cc. alc. and 22 cc. aq.  $\text{NH}_4\text{OH}$ , 8.5 g. (a) yields 7.5 g. 1-amino-2-benzoylanthraquinone, red needles from AcOH, m.  $190^{\circ}$ ; when 30 g. in 330 cc. concd.  $\text{H}_2\text{SO}_4$  at  $5-10^{\circ}$  are slowly treated with 250 g.  $\text{HNO}_3\text{-H}_2\text{SO}_4$  (corresponding to about 8 g.  $\text{NaNO}_2$ ) at such a rate that the temp. does not rise above  $17-22^{\circ}$ , stirred 45 min. at room temp. after a test portion introduced into  $\text{H}_2\text{O}$  gives no more red ppt., poured in a thin stream upon ice at such a rate that the temp. remains below  $35^{\circ}$ , treated with 10 g. Cu powder, heated 2 hrs. on the  $\text{H}_2\text{O}$  bath, brought to a boil, filtered, washed with hot  $\text{H}_2\text{O}$  and freed from the last traces of Cu with warm 2%  $\text{HNO}_3$ , there is obtained 29 g. anthraquinone-2,1-fluorenone (I), golden yellow leaflets from  $\text{PhNO}_2$ , m.  $317^{\circ}$ , forms an intensely red vat dye with  $\text{Na}_2\text{S}_2\text{O}_4$ . If to 80 g. KOH at  $220-5^{\circ}$  8 g. (I) are added in the course of 0.5 hr., kept 10 min. longer at the same temp., boiled up with  $\text{H}_2\text{O}$ , filtered and acidified with HCl a small amt. of brown yellow flocks (b) is obtained which m.  $115-20^{\circ}$  and then evolve gas (probably  $\text{CO}_2$ ) energetically, give an intensely red vat dye with  $\text{Na}_2\text{S}_2\text{O}_4$ . The HCl filtrate yields not inconsiderable amts. of BzOH. Heated 2 hrs. on the  $\text{H}_2\text{O}$  bath with 10 parts  $\text{H}_2\text{SO}_4$ , then allowed to stand 10 days at room temp. and poured into  $\text{H}_2\text{O}$  (b) gives a product which, contrary to (b), is only partially sol. in

alkalies,  $\text{Et}_2\text{O}$ , alc., etc. Boiled with alc. and filtered hot, the insol. portion seps. from  $\text{PhNO}_2$  in red-yellow needles (c), m.  $351^\circ$ , insol. in alkalies, seps. from concd.  $\text{H}_2\text{SO}_4$  on addition of  $\text{H}_2\text{O}$  in orange-yellow flocks sol. in alk.  $\text{Na}_2\text{S}_2\text{O}_4$  with intense green color; the substance is identical with Ullmann and Desgupta's anthraquinone-2,3-fluorenone (C. A. 8, 1584). The hot alc. ext. of the crude (c), on evapn. to dryness and crystn. from  $\text{PhMe}$ , yields light yellow needles (d), m.  $235-40^\circ$ , sol. in alkalies with light red color and in  $\text{Na}_2\text{S}_2\text{O}_4$  with intense red color. The analysis of the not quite



pure Ag salt of (b) (which gave values intermediate between those for a mono- and a di- $\text{CO}_2\text{H}$  acid) and the red color of its soln. in  $\text{Na}_2\text{S}_2\text{O}_4$  indicate the presence of a small amt. of a monobasic acid (II), but the formation of (c) on condensing (b) with  $\text{H}_2\text{SO}_4$  shows that the action of the KOH on (I) did not stop with the formation of (II) but also opened the anthraquinone ring and gave considerable amts. of a dibasic acid (III). (d) is probably a monobasic acid with the anthraquinone nucleus formed as an intermediate product in the condensation of (III) to (c).

CHAS. A. ROUILLER.

**Reduction of methyl formylphenylacetate to methyl tropate.** WILHELM WISLICHENUS AND ERNST A. BILHUBER. Univ. Tübingen. *Ber.* 51, 1237-8(1918); cf. Müller, C. A. 12, 2556.—M.'s "new synthesis of tropic acid" is based on W.'s reduction method (C. A. 3, 790) and the "synthesis of tropic acid" was effected in W.'s lab. in 1915 (Bilhuber, *Diss. Tübingen*, 1915, 41), in the course of which was obtained *methyl tropate* (a). Four g.  $\text{HCOCHPhCO}_2\text{Me}$  in 10 parts abs.  $\text{Et}_2\text{O}$  were treated with a large excess of Al-Hg (activated), then slowly with  $\text{H}_2\text{O}$  with stirring until, after several hrs., the  $\text{FeCl}_3$  reaction of the soln. had disappeared; after standing some further length of time it was filtered and evapd.; there remained 2.4 g. (a) as a colorless oil, b<sub>p</sub>  $159-62^\circ$ , m.  $36.5-7.5^\circ$ ; 2 g. boiled a few min. with 0.26 g. Na in 8 cc. MeOH and 0.3 g.  $\text{H}_2\text{O}$  gave 1.3 g. Na *dl*-tropate which on short warming with a slight excess of dil.  $\text{H}_2\text{SO}_4$  and extrn. with  $\text{Et}_2\text{O}$  gave 80% of the acid, needles or rhombic tablets from  $\text{H}_2\text{O}$ , m.  $117-8^\circ$ .

CHAS. A. ROUILLER.

**Naphthylacetic acids. III. 1-Nitronaphthyl-2-pyruvic acid and 1-nitronaphthyl-2-acetic acid.** FRITZ MAYER AND TRUDI OPPENHEIMER. Univ. Frankfurt a/M. *Ber.* 51, 1239-45(1918); cf. C. A. 12, 2566.—From 5 g.  $1,2\text{-C}_{10}\text{H}_7(\text{NO}_2)\text{CH}_2\text{COCO}_2\text{H}$  (a) and 1.6 g. NaOH in 100 cc. cold  $\text{H}_2\text{O}$  treated with a soln. of 4 g.  $\text{KMnO}_4$ , were obtained 1.5 g. *1-nitro-2-naphthaldehyde*, leaflets from ligroin, m.  $99^\circ$ , volatile with steam, and 1.2 g. of the acid (b), brown powder, m.  $239^\circ$ , reduced by  $\text{FeSO}_4\cdot\text{NH}_4\text{OH}$  to the  $\text{NH}_2$  acid, m.  $202-5^\circ$ . Treatment of (a) with Br-NaOH likewise gave (b). With  $\text{FeSO}_4\cdot\text{NH}_4\text{OH}$ , (a) gives  $\alpha$ -naphthindolecarboxylic acid, m.  $213^\circ$ ; Na-Hg yields the same product. When 5 g. (a) heated in 10 parts  $\text{H}_2\text{O}$  and 15 g. of 10% HCl are treated with 1.4 g.  $\text{NaNO}_2$  in a little  $\text{H}_2\text{O}$  there is obtained a compd. m.  $131^\circ$  which does not yield  $\text{HOCH}_2\text{H}_5\text{CO}_2\text{H}$  when boiled with  $\text{H}_2\text{O}$  and which is thought to be *1-nitro-2-naphthylacetone-nitrile*. If 5 g. (a) in a little 20% NaOH and 300 cc.  $\text{H}_2\text{O}$  is distd. with steam, some  $\text{O}_2\text{NC}_{10}\text{H}_7\text{Me}$  passes over; when this ceases to distil, the residue is filtered and acidified, whereupon a brown substance turning red in the air seps.; this, when boiled with  $\text{NaHSO}_3$ , gives a substance which yields 2 compds., depending on whether it is decompd.

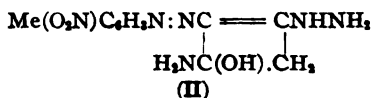
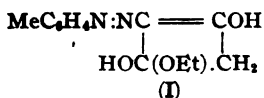
by cold or hot  $\text{H}_2\text{SO}_4$ ; in the cold is formed *1-nitro-2-naphthylacetaldehyde*, yellow crystals from alc., m.  $212^\circ$ , which on treatment with  $\text{PhNHNH}_2$  apparently undergoes an oxidation similar to that in osazone formation and the resulting yellow *hydrazosone*, m.  $162^\circ$ , is accordingly assigned the structure  $\text{O}_2\text{NC}_{10}\text{H}_7\text{CH}(\text{OH})\text{CH}:\text{NNHPh}$ . If the  $\text{NaHSO}_3$  compd. is decompd. with hot  $\text{H}_2\text{SO}_4$ , it yields  $\alpha$ -naphthisatin, m.  $248^\circ$ .  $1,2\text{-C}_{10}\text{H}_7(\text{NO}_2)\text{CH}_2\text{CO}_2\text{H}$  with  $\text{FeSO}_4\cdot\text{NH}_4\text{OH}$  gives  $\alpha$ -naphthoxindole, m.  $247^\circ$ .

CHAS. A. ROUILLER.

**Synthesis of oxalomonoester- and oxalomonoamide[chloroarylhydrazone] acid chlorides and corresponding cyanohydrazones.** CARL BÜLOW AND RICHARD ENGLER. Univ. Tübingen. *Ber.* 51, 1246-70(1918); cf. *C. A.* 12, 2562.—Assuming the "aliphatic-cyclic" structure for acetoacetic ester and similarly constituted 1,3-diketone and 1,3-ketocarboxylic acid derivs. *o*-tolueneazoacetoacetic ester (*C. A.* 2, 2937) is to be represented by the formula (I). It can be obtained in 280 g. yield from 134 g. of *o*- $\text{MeC}_6\text{H}_4\text{NH}_2$  by the method described in the earlier paper if care is taken to use the most concd. soln. possible of the diazonium salt from the purest  $\text{MeC}_6\text{H}_4\text{NH}_2$  and never to let a "milky turbidity" appear during the coupling. The light yellow (I) m.  $52^\circ$  (given before as  $67^\circ$ ). Short boiling with 1% KOH hydrolyzes it and the pure yellow soln. on cooling deposits the *potassium salt* in long, yellow, silky needles. If (I) is covered with concd.  $\text{HNO}_3$ , the crystals at once change with slight evolution of heat into a greenish orange oil; if, however, it is at once cooled and treated with cold  $\text{H}_2\text{O}$  it becomes viscous and yellow; the tar dissolves in boiling 96% alc. and after several days a *nitro derivative* (a) seps. in needles. The original dil.  $\text{HNO}_3$  mother liquors decanted from the "oil" contain a diazonium salt in relatively large amt., for when coupled in soda soln. with R acid there is formed at once a dye similar to ponceau R which gradually seps. in orange flocks. The decompn. of (I) therefore takes place in 2 or 3 phases: (1) nitration; (2) decompn. into  $\text{MeC}_6\text{H}_4\text{N}_2\text{NO}_2$  and a cyclo-aliphatic part, acetoacetic ester,  $\text{CH}_2\text{C}(\text{OH})\cdot\text{CH}_2\cdot\text{C}(\text{OH})\text{OEt}$ . If the (I) is treated in AcOH with  $\text{HNO}_3$ , the nitration

predominates over the decompn. (a) m.  $135-6^\circ$ ; that it is a deriv. of (I) with a  $\text{NO}_2$  group in the  $\text{C}_6\text{H}_4$  nucleus is shown by the fact that when boiled a few min. with  $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$  in AcOH it yields [*nitro-o-tolueneazo*]-3-methylpyrazolone, yellow-orange needles, m.  $223-4^\circ$  (decompn.). When a cooled soln. of 100 g. (I) in 600 cc. alc. is treated, with turbinig, with a vigorous stream of Cl cryst.  $\text{MeC}_6\text{H}_4\text{NHN}:\text{CClCO}_2\text{Et}$  (b) begins to sep. in about 45 min.; when the mixt. becomes too stiff to stir well it is filtered and the filtrate is again treated with Cl in the cold, the process being repeated 2-3 times; the (b) is then dissolved in the least possible amt. of boiling alc. and treated without cooling with a slower stream of Cl; the process is repeated once more and the mixt. set in ice, whereupon *monoethyl oxalyl chloride p-chloro-o-tolylhydrazosone* ("*oxalomonoester-[p-chloro-o-tolylhydrazosone] acid chloride*") (c) is obtained in 60 g. yield, needles from alc. or AcOH, m.  $110^\circ$ , sol. in concd.  $\text{H}_2\text{SO}_4$  with intense yellow color, becoming paler in a few sec. and gradually changing to a dirty, faint, brownish green; if the soln. is poured into ice  $\text{H}_2\text{O}$  after 3.5 hrs., it gives a milky turbidity slowly depositing fine, white needles, m.  $109^\circ$ ; the  $\text{H}_2\text{SO}_4$  soln. heated to about  $100^\circ$  becomes light brown and gives no "milky turbidity" with  $\text{H}_2\text{O}$ ;  $\text{FeCl}_3$  gives no characteristic reaction in either acid or alk. soln. If (c) is covered with concd.  $\text{HNO}_3$ , the crystals first become intensely yellow, then slowly change into a brown oil floating on the  $\text{HNO}_3$  which becomes red-brown; after diin. with  $\text{H}_2\text{O}$  and extn. with  $\text{Et}_2\text{O}$ , relatively much diazonium salt remains in the acid. This "oxidative cleavage" is lessened, as compared with the simple nitration, if the (c) is first dissolved in AcOH before being treated with  $\text{HNO}_3$ . When 5 g. (c) in 60 cc. hot alc. is treated with 7.4 g. KCN in 4 cc. cold  $\text{H}_2\text{O}$ , allowed to stand 15 min. and cooled with ice, there is obtained 3.8 g. of the corresponding *cyanide*,  $\text{ClMeC}_6\text{H}_4\text{NHN}:$

$C(CN)CO_2Et$ , golden yellow needles from alc., m.  $163.5^\circ$ , sol. in warm, very dil. alkalis with pure yellow color and repptd. by  $CO_2$ , sol. in concd.  $H_2SO_4$ , also with pure yellow color and repptd. unchanged by  $H_2O$ . In concd.  $HNO_3$  at  $40-50^\circ$  it dissolves with reddish yellow color and on cooling a *nitro derivative*, m.  $121-2^\circ$ , seps. while the dild. and filtered soln. contains relatively much diazonium salt. With Zn dust and HCl in boiling alc., (c) gives  $4,2-ClMeC_6H_4NH_2$ . A *labile form* of the above cyanide, m.  $106.5^\circ$  and passing into the stable form m.  $163.5^\circ$ , is obtained in 4.1 g. yield by treating 3 g.  $4,2-ClMeC_6H_4NH_2.HCl$  in 17 cc. concd. HCl with acidified  $NaNO_2$  (the temp. can be allowed to rise to  $20^\circ$ ) and very slowly running the clear soln. into 1.9 g.  $NCCH_2CO_2Et$  and 30.7 g. crystd.  $NaOAc$  in 137 cc. alc. It is also easily converted into the stable form by boiling 0.5 hr. in  $AcOH$ . *o-Tolueneazoacetoacetamide*, obtained in 6.8 g. yield by shaking 15 g. (I) with 25 cc. of 96% alc. and 60 cc. aq.  $NH_4OH$ , letting stand 8 days, adding 25, 25 and 50 cc. alc. after 2, 4 and 6 days, resp., and fractionally crystg. from abs. alc. (which gives a very small amt. of the very difficultly sol. *ammonium salt*, m.  $202^\circ$  (decompn.), yielding, on crystn. from concd.  $AcOH$ , the free *acid* in long, greenish yellow needles, m.  $137-8^\circ$ ), seps. in broad, golden yellow needles which dissolve in concd.  $HNO_3$  at  $45^\circ$  with greenish yellow color, the soln. on cooling depositing the *nitro derivative*, m.  $243-4^\circ$ ; only a little diazonium salt is present in the  $HNO_3$ , whereas it is the main product when the amide is treated in alc. suspension with Cl. *p-Tolueneazoacetoacetic ester* (d), obtained in 95% yield like (I), m.  $73-4^\circ$ ; if kept 3.5 hrs. at  $79-80^\circ$  and then allowed to solidify it now m.  $75-7^\circ$  and if heated to  $130^\circ$  its m. p. becomes quite indefinite ( $64-77^\circ$ ). Towards 1-2%  $KOH$ , 'concd.  $HNO_3$ ,  $AcOH-HNO_3$ , it behaves like (I); the *nitro derivative* m.  $143-4^\circ$ , and with  $N_3H_4$  in  $AcOH$

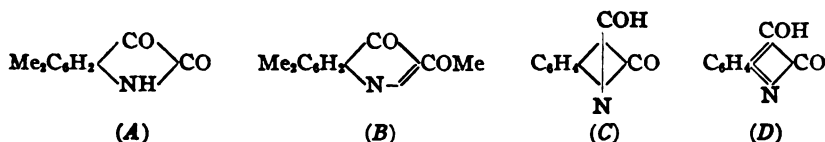


gives 3-methyl-4-[*nitro-p-tolueneazo*]pyrazolone, m.  $234^\circ$ . *Monoethyl oxalyl chloride 2-chloro-4-methylphenylhydrazone* (e), obtained like (c) in 60% yield, m.  $100^\circ$ , can be boiled with  $H_2O$  a long time without change, gives a diazonium salt with concd.  $HNO_3$ . *Monoethyl oxalyl chloride 4-methylphenylhydrazone*, obtained in 2.6 g. yield by passing Cl (180-200 bubbles per min.) into 5 g. (d) in 50 cc. cold  $CCl_4$  until the increase in wt. is 0.7-0.8 g., letting stand 1 day, during which time much HCl is evolved, and allowing to evap. in shallow dishes, long, felted needles from alc., m.  $101-1.5^\circ$ , sol. in concd.  $H_2SO_4$  without change, with yellow color, but if allowed to stand in the acid soln. it undergoes deep-seated decompn., behaves towards concd.  $HNO_3$  like (e), converted by alkalis into ditolyltetrazinedicarboxylic ester. *Monoethyl oxalonitrile 2-chloro-4-methylphenylhydrazone*, obtained in 65% yield, golden yellow needles from  $AcOH$ , m.  $160^\circ$ , sol. slowly in concd.  $H_2SO_4$  with yellow color, both nitrated and decompd. by  $HNO_3$ , the resulting diazonium salt giving a ponceau-red dye with R acid, sol. in alkali with yellow color and repptd. by  $CO_2$  in a *labile form*, cryst. flocks. Treated with Cl in alc. suspension (the temp. can be allowed to rise to  $40^\circ$ ) it deposits white crystals, the filtrate from which contains considerable  $2,4-ClMeC_6H_4N_2Cl$ , which with  $\alpha-C_{10}H_7NH_2$  gives a compd. sol. in alc. HCl with fuchsin-red color changing to brown-yellow on addition of  $NaOAc$ , with  $\beta$ -naphthol dark red needles, m.  $171-2^\circ$ , with  $m-C_6H_4(OH)_2$  a yellow-brown compd. changing to brown-yellow with excess of  $AcOH$ , and with R salt a red dye of the ponceau series. The "white crystals" are the  $NH_4$  salt of the acid corresponding to the nitrile. With Zn dust and alc. HCl (e) gives  $2,4-ClMeC_6H_4NH_2$ . The nitrile is also obtained in 5 g. yield from 3 g.  $2,4-ClMeC_6H_4NH_2$  and  $NCCH_2CO_2Et$ . *p-Tolueneazoacetoacetamide*, obtained in 85% yield, light green leaflets from alc., m.  $173^\circ$ , gives with  $HNO_3$ , together with a little diazonium salt, chiefly the *o*(?)-*nitro de-*

ivative, m.  $211-2^{\circ}$ , which with  $N_2H_4$  yields a pyrazolone m.  $235-5.5^{\circ}$ ; as intermediate product is formed a yellow hydrazone (II). The amide (2 g.) treated in 60 cc. boiling alc. with Cl gives 1.5 g. oxalomonoamide chloride 2-chloro-4-methylphenylhydrazone, microneedles from alc., gives a little diazonium salt with  $HNO_3$ , dissolves in  $H_2SO_4$  with yellow color, in  $C_6H_5N$  without color, but the soln. soon becomes pink and on warming deep brown-yellow; if the soln. is now dild. and acidified a yellow powder slowly seps. (tetrazine formation); the HCl salt with KCN gives the amide cyanide.

CHAS. A. ROUILLER.

New isomerisms in the isatin series. II. GUSTAV HELLER. Univ. Leipzig. Ber. 51, 1270-81(1918); cf. C. A. 12, 2552.—Further investigation has cleared up the relationship between the four isomeric forms of 2,4-dimethylisatin (a). The form designated (I) and already considered as a lactam form corresponds in all respects with the isatin proved to be a lactam and therefore has the structure (A); it gives the indophenin reaction, shows the color change in the alk. soln., gives Na and Ag salts entirely similar to those of isatin and with aq.  $PhNHNH_2$  soon forms a yellow phenylhydrazone. Of the isomer (II), which also gives the indophenin reaction, the supposed O-Ag salt (from the Na salt and  $AgNO_3$ ) has been found to deflagrate on heating and to contain much more Ag than the amt. calcd. for a simple Ag salt. The N-Ag salt (from (A) in alc. with  $AgOAc$ ) gives with MeI in  $C_6H_6$  after 2.5 hrs. at  $100^{\circ}$  the Me ether, m.  $232^{\circ}$  (the m. p. formerly given was erroneous) of (I), which therefore has the structure (B), and as (II) is formed from (A) (from the Ag salt and  $BzCl$ ), has the same compn., is monomol., gives the indophenin reaction and yields (B) on short warming with undild.  $Me_2SO_4$ , it has the lactim structure corresponding to (B). That the Me ether really has the structure (B) is shown by the fact that when finely ground and heated some hrs. on the  $H_2O$  bath with dil. NaOH it dissolves and on acidification yields (A). Boiled 3 hrs. in  $AcOH$ , it is likewise largely converted into (A); there is also formed a small amt. of alk.-insol. substance which, however, is not identical with the N-ether. The salts of (a) always regenerate pure homogeneous (A) and are therefore N-salts; in



general there is no evidence that the lactim can form salts of its own; its  $C_6H_6$  soln. does not change color on addition of alc.  $NH_3$  and on concn. deposits the unchanged lactim; the red  $C_6H_5N$  soln., however, at once assumes a bluish red color with  $Ba(OH)_2$ . Since isatol can be converted back into isatin, gives no indophenin reaction and shows no color change with alkalis, it can have only the structure (C) or (D), and the violet to blue salts of  $\alpha$ -isatin derivs. must therefore also be N-salts. Likewise isatin dianil, in which there is no possibility of rearrangement, gives a blue N-salt; the yellow alc. soln. becomes intensely blue with  $NaOEt$  or alc. NaOH, even in the cold. These results establish the analogy between (a) and isatin. As already reported, the lactim when dissolved in alkali rearranges into the isomer (III), which has isatol properties and on more vigorous treatment with alkali is converted into (A). The lactim is apparently a pseudo acid of the isatol only, because it is not regenerated from the isatol. If the reaction between the Ag salt of (A) and  $BzCl$  is carried out in pure thiophene-free  $C_6H_6$  protected from atm. moisture the amt. of regenerated (A) is much diminished and practically only the lactim is formed. Ag isatin in thiophene-free  $C_6H_6$  gives chiefly isatol and as the process in other respects proceeds in the same manner as in the case of (A) it is probable that here too the lactim is first formed. In the action of alkalis on isatin

O-Me ether no isatol was obtained but as the latter also forms isatinic acid with alkalis, though not so rapidly, its formation as an intermediate product is not excluded and the process is probably as follows: Me ether  $\rightarrow$  lactim  $\rightarrow$  isatol  $\rightarrow$  isatinate. Also, as the salts of isatin are *N*-salts, a smooth conversion of the lactim into the lactam in alk. soln. has not yet been established. That it does not take place is rendered probable by the behavior of the lactim form of (a) which in alk. soln. smoothly forms the isatol. In acids the conversion lactim  $\rightarrow$  lactam has been established. Isatin chloride also with Zn dust and AcOH smoothly gives indigo and the mother liquors yield a little isatin, probably formed from the intermediate lactim, but in alkali there is no such smooth regeneration of isatin; if the chloride is allowed to stand in alkali it dissolves in a few hrs. with brown color, leaving indigo-like dyes undissolved; the alk. soln. on acidification yields dark flocks possibly containing isatole and the acid filtrate on long standing deposits some isatin. As to the tautomerism between lactim and isatol it has been found, in the cases thus far studied, to be homogeneous, represented in 1 direction by the smooth rearrangement of the lactim of (a) into the isatol and in the other by heating the isatol with 50% AcOH; unlike other solvents, which give a yellow color, this gives a red soln. due to immediate rearrangement; if sufficiently concd. the soln. even while still hot deposits (B). Likewise the Me ether of the isatol gives quite rapidly the green indophenin reaction of (B). In the absence of acids the tautomerism phenomenon does not appear; the Na salt of the isatol gives with MeI the same isatol ether as the Ag salt. As to isomer (IV), obtained by recrystg. the isatol from AcOH in red needles, sintering above 285°, m. 315° (decompn.), it apparently contains another ring system insol. in alkalies and showing basic properties. Its Me ether on short heating with 50% AcOH is hydrolyzed back to the original substance. 2,4,5-Trimethylisatin can also be obtained by slowly treating the oxindole compd. in 10 parts AcOH at about 50° with  $\frac{1}{8}$  part  $\text{CrO}_3$  in a little  $\text{H}_2\text{O}$ ; its finely divided paste with very dil. alkali dissolves in the cold with dark red color but in more concd. alkali it dissolves with difficulty even on warming, as the salt is insol. in excess of alkali. The Ag salt, granules from  $\text{C}_6\text{H}_6$ , slowly m. from 250° up, is prepd. from 9.5 g. of the isatin in 850 cc. alc. and 8.5 g.  $\text{AgOAc}$  in 900 cc.  $\text{H}_2\text{O}$ ; 9 g. heated 2 hrs. on the  $\text{H}_2\text{O}$  bath with 4.2 g.  $\text{BzCl}$  in 90 cc.  $\text{C}_6\text{H}_6$ , gives, besides the unchanged isatin, *trimethylisatol*, granules from the very concd. mother liquors, does not react with alc.  $\text{PhNHNH}_3$ , sol. in cold dil. soda and in  $\text{NH}_4\text{OH}$  with blood-red color; the soln. in dil.  $\text{NaOH}$  is decolorized on boiling 1-2 min. and acids ppt. the isatin. The isatolseps. from AcOH in fine, dark red needles, m. 229-30°, which are insol. in alkali and are therefore a rearrangement product.

CHAS. A. ROUILLER.

Nucleus halogen-substituted silicon hydrocarbons and their use in syntheses. GERHARD GRÜTTNER AND MARIANNE CAUER. Techn. Hochschule, Berlin. *Ber.* 51, 1283-92 (1918); cf. *C. A.* 12, 1388.—The following *p*-bromophenylsilylic esters,  $\text{BrC}_6\text{H}_4\text{-Si(OR)}_3$ , were prepd. by slowly adding 20 g.  $\text{BrC}_6\text{H}_4\text{SiCl}_3$  to about 3 times the calcd. amt. of the cold alc., distg. off the excess of alc. under atm. pressure and fractionating the residue *in vacuo*; yield, 50%, together with considerable amts. of much higher boiling substances; they are colorless liquids of pleasant odor, rapidly decompd. by  $\text{H}_2\text{O}$ , reacting rapidly in  $\text{Et}_2\text{O}$  with etched Mg: *methyl*,  $b_{11.5}$  136°,  $d_4^{20}$  1.3525,  $d_4^{20}$  1.3493,  $n$  1.50791,  $n$  1.51210, 1.52296 for  $\text{H}_\alpha$ , D and  $\text{H}_\beta$  at 16.5°. *Ethyl*,  $b_{12}$  149-50°,  $d_4^{16.6}$  1.2276,  $d_4^{20}$  1.2244,  $n$  1.48872, 1.49247, 1.50206 at 15.4°; *propyl*,  $b_{14}$  175-6°,  $d_4^{18.6}$  1.1564,  $d_4^{20}$  1.1553,  $n$  1.48144, 1.48497, 1.49386, 1.50129 for  $\text{H}_\alpha$ , D,  $\text{H}_\beta$  and  $\text{H}_\gamma$  at 16.6°; *isobutyl*,  $b_{14}$  190-1°,  $d_4^{17.2}$  1.0949,  $d_4^{20}$  1.0923,  $n$  1.47531, 1.47865, 1.48698, 1.49424, at 14.9°. The following *p*-triethylsilylphenyl alcohols were obtained by slowly adding twice the calcd. amt. of aldehyde to the Mg compd. from 0.1 mol. *p*- $\text{BrC}_6\text{H}_4\text{SiEt}_3$  in 100 g.  $\text{Et}_2\text{O}$ , boiling 4 hrs., decompg. with  $\text{H}_2\text{O}$  and dil.  $\text{H}_2\text{SO}_4$ , drying

the  $\text{Et}_2\text{O}$  layer with  $\text{Na}_2\text{SO}_4$  and fractionating *in vacuo*. Only the first is obtained in good yield; all are thick, colorless liquids of pleasant odor, insol. in  $\text{H}_2\text{O}$ . *Ethanol*,  $\text{Et}_3\text{SiC}_6\text{H}_4\text{CH}(\text{OH})\text{Me}$ ,  $b_{14.5}$  173–4°,  $d_4^{19.5}$  0.9601,  $d_4^{20}$  0.9596,  $n$  1.51404, 1.51822, 1.52885, 1.55810 at 17.2°,  $dn/dt$  –0.00042, –0.00042, 0.00043 for  $\text{H}_\alpha$ , D and  $\text{H}_\beta$ ; *propanol*,  $b_{18.5}$  185°,  $d_4^{17.0}$  0.9663,  $d_4^{20}$  0.9575,  $n$  1.51243, 1.51661, 1.52734 for  $\text{H}_\alpha$ , D and  $\text{H}_\beta$  at 18°; *butanol*,  $b_{21}$  199–201°,  $d_4^{14}$  0.9546,  $d_4^{20}$  0.9491,  $n$  1.50373, 1.50754, 1.51737; *isobutanol*,  $b_{18}$  190–2°,  $d_4^{15.6}$  0.9535,  $d_4^{20}$  0.9512,  $n$  1.50820, 1.51212, 1.52231 at 19.2°,  $dn/dt$  –0.00042, –0.00043, –0.00044 for  $\text{H}_\alpha$ , D and  $\text{H}_\beta$ . *Triethylsilicol*,  $\text{Et}_3\text{SiOH}$ , obtained in good yield by heating the ethanol with fuming  $\text{HCl}$  in a sealed, tube at 90°,  $b_{14.5}$  70.5°,  $d_4^{19.7}$  0.8650,  $d_4^{20}$  0.8647,  $n$  1.43393, 1.43639, 1.44228, 1.44675  $dn/dt$  –0.00042, –0.00043, –0.00044. *p-Triethylsilylphenylsilicon trichloride*, obtained in 39 g. yield from 117 g.  $p\text{-BrC}_6\text{H}_4\text{SiEt}_3$  and 12 g.  $\text{Mg}$  in 200 cc.  $\text{Et}_2\text{O}$  added to 100 g.  $\text{SiCl}_4$  in  $\text{Et}_2\text{O}$ , strongly refractive oil of penetrating odor,  $b_{14.5}$  173–6°, fumes in the air and is immediately hydrolyzed by  $\text{H}_2\text{O}$ ; 40 g. boiled 2 hrs. with 97 g.  $\text{EtBr}$  and  $\text{Mg}$  in 250 cc.  $\text{Et}_2\text{O}$  gives 15.5 g. of *bis-p-triethylsilylbenzene*, rather mobile oil of faint, not unpleasant odor,  $b_{14.5}$  195–6°,  $d_4^{17.6}$  0.8989,  $d_4^{20}$  0.8967,  $n$  1.50555, 1.50942, 1.51945, 1.52788 at 15.7°,  $dn/dt$  –0.00043, –0.00041, –0.00043, –0.00042. Treated very slowly with 4 atoms  $\text{Br}$  and a little  $\text{Fe}$  filings, it gives  $p\text{-C}_6\text{H}_4\text{Br}_2$  and  $\text{Et}_3\text{SiBr}$ ,  $b_{14}$  66.5°, loses  $\text{HBr}$  abundantly in moist air, at once hydrolyzed by  $\text{H}_2\text{O}$ ,  $d_4^{20}$  1.1766,  $n$  1.46402, 1.46705, 1.47447, 1.48074 at 15.7°. *Phenyl-p-bromophenylsilicon dichloride*, from  $\text{PhSiCl}_2$  boiled 5 hrs. in  $\text{Et}_2\text{O}$  with  $p\text{-C}_6\text{H}_4\text{Br}_2$  and  $\text{Mg}$ , oil fuming in the air,  $b_{14}$  199–200°,  $d_4^{18.5}$  1.5019,  $d_4^{20}$  1.5005,  $n$  1.60294, 1.60921, 1.62531, 1.63953 at 19°. *Diethoxyphenyl-p-bromophenylsilane*,  $\text{Ph}(\text{BrC}_6\text{H}_4)\text{Si}(\text{OEt})_2$ ,  $b_{17}$  201°,  $d_4^{21.6}$  1.2474,  $d_4^{20}$  1.2488,  $n$  1.54525, 1.55031, 1.56322, 1.57467 at 19°, is obtained from  $\text{Ph}(\text{BrC}_6\text{H}_4)\text{-SiCl}_2$  and excess of  $\text{EtOH}$ ; at the same time is formed a compd.  $b_{30}$  317–8°,  $d_4^{22}$  1.3350,  $d_4^{20}$  1.3369,  $n$  1.57867, 1.58437, 1.59895, 1.61146 at 18.6°, mol. wt. in freezing  $\text{C}_6\text{H}_6$  550, which is apparently *bis[ethoxyphenyl-p-bromophenyl]disiloxan*,  $[\text{Ph}(\text{BrC}_6\text{H}_4)(\text{EtO})_2\text{-Si}]_2\text{O}$ .  $\text{EtMgBr}$  and  $\text{Ph}(\text{BrC}_6\text{H}_4)\text{SiCl}_2$  boiled several hrs. in  $\text{Et}_2\text{O}$  give *diethylphenyl-p-bromophenylsilane*,  $b_{14.5}$  203–3.5°,  $d_4^{19.7}$  1.2156,  $d_4^{20}$  1.2153,  $n$  1.57794, 1.58351, 1.59781, 1.61035 at 17.9°, and *diethylphenyl-p-ethylphenylsilane*,  $b_{14}$  169–70°,  $d_4^{19}$  0.98403,  $d_4^{20}$  0.98310,  $n$  1.55716, 1.56225, 1.57559, 1.58713. *Triethyl-p-ethylphenylsilane*, from  $\text{EtMgBr}$  and  $\text{BrC}_6\text{H}_4\text{SiCl}_2$ ,  $b_{18}$  117–8°,  $d_4^{18.2}$  0.8969,  $d_4^{20}$  0.8950,  $n$  1.50272, 1.50671, 1.51697, 1.52583 at 20.7°. All the values for  $d$ . given above are reduced to vacuum.

CHAS. A. ROUILLER.

**Organic lead compounds. VIII. Mixed lead alkyl aryls of the type  $\text{Alk}_3\text{PbAr}$ .** GERHARD GRÜTTNER and GERTRUD GRÜTTNER. Techn. Hochschule, Berlin. *Ber.* 51, 1293–8(1918).—These compds. are prepd. according to the scheme  $\text{Alk}_3\text{PbX} + \text{ArMgX} = \text{Alk}_3\text{PbAr} + \text{MgX}_2$ . Diaryls are always formed to some extent, and as their  $b$ . ps. are higher than those of the trimethyl- but lower than those of the triethylead aryls, sepn. can be effected in all cases by fractional distn. or, if the diaryls cryst., by freezing out, as the alkylaryls do not solidify even at low temps. The compds. are colorless, strongly refractive oils of faint odor, distil *in vacuo* in a  $\text{CO}_2$  atm. without decompn. ( $\text{Et}_3\text{PbCH}_2\text{Ph}$  splits off a little  $(\text{PhCH}_2)_2$ ) while in air a small amt. of a yellow-brown ppt. is sometimes formed. With steam the tri-Me derivs. are easily, the tri-Et compds. rather difficultly volatile; when pure they are stable for months even in air and diffuse light; heated above 200°, they deposit  $\text{Pb}$ ; when ignited they burn with a reddish flame and formation of a cloud of  $\text{PbO}$ . With  $\text{Br}$  in  $\text{Et}_2\text{O}$  at –75° they split off the aryl and sometimes one of the alkyls to a slight extent. The crude products were all prepd. by boiling 0.2 mol.  $\text{Alk}_3\text{PbBr}$  with 0.3 mol.  $\text{ArMgBr}$  1 hr. in  $\text{Et}_2\text{O}$ ; the method of purification differed for each. *Trimethylphenyllead* (yield, 66%),  $b_{18}$  104°,  $d_4^{23.7}$  1.7342,  $d_4^{20}$  1.7376,  $n$  1.5753, 1.5816, 1.5988, 1.6138 for  $\text{H}_\alpha$ , D,  $\text{H}_\beta$  and  $\text{H}_\gamma$  at 23.7°.

*Trimethyl-p-tolyllead* (yield, 34%),  $b_{11}$  118–9°,  $d_4^{20}$  1.6826,  $d_4^{21.6}$  1.6812,  $n$  1.5672, 1.5732, 1.5895, 1.6039 at 20°. *o-Isomer* (yield, 48%),  $b_{11}$  117.5–8.0°,  $d_4^{21.4}$  1.7395,  $d_4^{20}$  1.7408,  $n$  1.5734, 1.5793, 1.5954, 1.6095 at 21.4°. *Triethylphenyllead* (yield, 61%),  $b_{11}$  135°,  $d_4^{21.1}$  1.5920,  $d_4^{20}$  1.5931,  $n$  1.5698, 1.5757, 1.5917, 1.6057 at 21.1°. *p-Tolyl homolog* (yield, 78%),  $b_{11}$  154°,  $d_4^{24.8}$  1.5237,  $d_4^{22}$  1.5262,  $d_4^{20}$  1.5281,  $n$  1.5629, 1.5686, 1.5842, 1.5979 at 22°. *o-Isomer*,  $b_{11}$  153.5°,  $d_4^{22.2}$  1.5832,  $d_4^{21.6}$  1.5839,  $d_4^{20}$  1.5853,  $n$  1.5682, 1.5740, 1.5897, 1.6035 at 21.5°. *Benzyl isomer*,  $b_{11}$  149–50.5°,  $d_4^{23}$  1.5374,  $n_D^{21.4}$  1.5843, deposits  $(PhCH_2)_2$  after each distn. *Triethyl- $\alpha$ -naphthyllead*,  $b_{11}$  176° (loss of  $C_{10}H_8$ ). *Trimethylbenzyllead*,  $b_{11}$  124° (decompn.). IX. *Triphenyllead monohalides*. GERHARD GRÜTTNER. *Ibid* 1298–303.—When  $Ph_4Pb$  is treated slowly with 2 mols.  $Br_2$  in  $Et_2O$  at  $-75^\circ$  (solid  $CO_2$ ) or in melting  $CS_2$ , the color disappears quite rapidly and the product consists chiefly of unchanged  $Ph_4Pb$  and  $Ph_3PbBr$ , with only about 10% of  $Ph_3PbBr$ ; this is probably due to the fact that the insol.  $Ph_4Pb$ , even though very finely divided, offers but a relatively small surface of attack to the  $Br$ , while the sol.  $Ph_3PbBr$  first formed reacts very much more rapidly. By using a suspension of  $Ph_4Pb$  in  $C_4H_9N$  and a soln. of  $Br$  in  $C_4H_9N$  at above  $-40^\circ$ , however,  $Ph_3PbBr$  is obtained almost quant. Triphenyllead bromide seps. from alc. in silky needles, sinters  $164^\circ$ , m.  $166^\circ$  to a clear liquid gradually depositing  $PbBr_2$ , deflagrates with reddish light and deposition of  $Pb$  when heated rapidly, causes sneezing when dry. *Iodide*, best obtained by treating each l. of the alc. mother liquors from the bromide with 40 g.  $KI$  in 100 g.  $H_2O$  and then with  $H_2O$  until the resulting turbidity only slowly redissolves, pale yellow, flat prisms, sinters  $139^\circ$ , m.  $142^\circ$ . *Oxide*, best obtained in small amts. by adding an excess of alc.  $NaOH$  or  $KOH$  to a hot alc. soln. of the bromide and pouring into 2 vols. cold, slightly alk.  $H_2O$ , forms a flocculent ppt. insol. in aq. but sol. in alc. alkalies. Large amts. are better prepd. by shaking a paste of the bromide and a little  $Et_2O$  for 2 hrs. with excess of 10% aq. alkali. *Chloride*, obtained quant. by shaking the oxide a short time with 15%  $HCl$ , needles or flat prisms from alc., sinters  $204^\circ$ , m.  $206^\circ$ . *Sulfide*, obtained as a white ppt. by passing  $H_2S$  into a concd. alc. soln. of the chloride, is remarkably sol. in organic solvents when freshly pptd. and quite stable towards heat.

CHAS. A. ROUILLER.

**The monohydrochloride of isoprene.** OSSIAN ASCHAN. Univ. Helsingfors. *Ber.* 51, 1303–7 (1918); cf. Bouchardt, *Jahresb.* 1879, 577.—The isoprene used had been prepd. from pure com. carvene by means of a Harries and Gottlob isoprene lamp (*C. A.* 5, 3583) and had stood 4 years in an ice chest at  $4-8^\circ$ . It contained considerable caoutchouc; 654 g. on steam distn. yielded 590 g. distillate and 36 g. white, spongy caoutchouc. Into 50 g. of the fraction of the distillate which b.  $34-5.5^\circ$ ,  $d_4^{20}$  0.6765, and 3 g.  $H_2O$ , cooled with snow- $NaCl$ , dry  $HCl$  was passed for several hrs.; the increase in wt. was 29 g. After washing with  $H_2O$ , drying with a little  $KOH$  and again satg. with  $HCl$  the portion of the product which distd. below  $90^\circ$ , there were obtained 22.6 g. b.  $107-10^\circ$  (constant at  $109^\circ$ ),  $d_4^{20}$  0.9335, with 33.99%  $Cl$  (calcd. for isoprene- $HCl$ , 33.97), and a fraction b.  $87-90^\circ$ , d. 0.8702, with 33.59%  $Cl$  (calcd. for amylene- $HCl$ , 33.33%). Therefore, contrary to B., the fraction b. below  $90^\circ$  is  $Me_3CClEt$ ; a sample prepd. from pure  $Me_3C:CHMe$  b.  $85-8^\circ$  and showed d. 0.8709. The presence of  $Me_3C:CHMe$  in the isoprene used was shown by means of the reaction with anhydrous  $AlCl_3$  (formation, with gas evolution, of a solid condensation product). The true isoprene hydrochloride smells like allyl chloride, decolorizes alk.  $KMnO_4$ , adds  $HCl$  and  $Br$ , darkens on standing, tends to lose a little  $HCl$  on distn., loses  $Cl$  and probably forms an alc. when boiled with  $K_2CO_3$  while heating in glacial  $AcOH$  with  $NaOAc$  to a large extent regenerates isoprene. Satd. in concd.  $HCl$  with  $HCl$  gas, it gives 94% of the dihydrochloride,  $b_{11}$   $52-3^\circ$ , b.  $145-6^\circ$ ,  $d_4^{20}$  1.0654; with  $Br$  in cold  $CHCl_3$  it forms the dibromide, a thick, yellowish oil. In the above expts. no condensation



to a caoutchouc-like substance was ever observed, as B. claims to be the case when HCl acts on isoprene.

CHAS. A. ROULLER.

**Synthesis of optically active glycerylphosphoric acid.** EMIL ABDERHALDEN AND EGON EICHWALD. *Ber.* 51, 1308-12 (1918).—To 14 g. *d*-bromohydrin,  $[\alpha]_D^{18}$  4.38°, in 100 g. anhydrous  $C_6H_5N$  in ice-NaCl 14 g.  $POCl_3$  are very slowly added in 10-5 drop portions, keeping the temp. below  $-10^\circ$ ; after 1-2 hrs. 300 cc. ice-cold  $H_2O$  are slowly added and the soln. is shaken with about 40 g.  $Ag_2SO_4$  (if this is not enough, more  $Ag_2SO_4$  is added in 1 g. portions until the filtrate no longer gives a reaction for Cl ions).  $H_2S$  is passed into the filtrate, the filtered soln. concd. somewhat *in vacuo*, made strongly alk. with  $Ba(OH)_2$ , dild. to 0.5 l., again concd. *in vacuo* to about 200 cc., filtered through a little charcoal, freed exactly of Ba with  $H_2SO_4$ , made alk. to phenolphthalein with 10% LiOH, then treated with 1.5 times as much more LiOH, allowed to stand 24 hrs., concd. *in vacuo* to about 150 cc., heated 1 hr. at  $80^\circ$ , cooled, neutralized to phenolphthalein with HBr, treated with a little charcoal if dark, concd. *in vacuo* to incipient sepn. of salts (which are redissolved with a few cc. of  $H_2O$ ), filtered, pptd. with 200 cc. abs. alc., dissolved in a little  $H_2O$ , again pptd. with alc., then again pptd. a 3rd time and dried at  $100^\circ$  *in vacuo* over  $P_2O_5$ . In spite of many attempts, the *dilithium d*-glycerylphosphate so obtained generally did not have exactly the compn.  $C_6H_7O_6PLi_2$ ; some samples had almost exactly the calcd. amt. of  $P_2O_5$  (38.74 instead of 38.59%), but in general the P content was too low and the C too high. Perhaps small amts. of diglycerylphosphate were formed. Yield, 3.5 g. The *d*-salt shows  $[\alpha]_D^{18}$  3.51°, the *l*-salt  $-3.02^\circ$ . A sample obtained with alc. instead of aq. LiOH showed  $[\alpha]_D^{18}$  6.26°.

CHAS. A. ROULLER.

**Optically active propyleneglycol and optically active  $\beta$ -hydroxybutyric acid.** EMIL ABDERHALDEN AND EGON EICHWALD. Univ. Halle a. S. *Ber.* 51, 1312-22 (1918); cf. *C. A.* 10, 464.—One kg.  $CH_2:CHCH_2NCS$  is hydrolyzed with 1.25 kg. of 20% HCl almost completely; the remainder of the oil distd. off *in vacuo*, the soln. of  $CH_2:CHCH_2NH_2 \cdot HCl$  concd. to about 800 cc., satd. at  $0^\circ$  with HCl gas, heated 5-6 hrs. at  $110-20^\circ$ , concd. as far as possible in a porcelain dish, allowed to stand 24 hrs. at room temp., filtered and the filtrate again satd. with HCl and heated in sealed tubes. The still moist *dl*- $MeCHClCH_2NH_2 \cdot HCl$  so obtained is treated in a little  $H_2O$  and ice under  $Et_2O$  with an excess of 33% KOH in small portions, shaking vigorously after each addition, removing the  $Et_2O$  layer before quite the calcd. amt. of KOH has been added, then adding the rest of the KOH and extg. repeatedly with  $Et_2O$ . The  $Et_2O$  soln. is concd. to about 300 cc. (some of the amine also distils over) and treated with an equal vol. of alc.; the amt. of amine is detd. by titration of an aliquot portion with alizarin-sulfonic acid as indicator and to the main soln. is added 1 mol. *d*-tartaric acid in  $H_2O$  to each mol. amine; soon *d*- $\beta$ -chloropropylamine tartrate (*a*) seps.; the rest of the  $Et_2O$  is now evapd. off and the (*a*) crystd. about 10 times from  $H_2O$ ; it m.  $109.5^\circ$  and shows  $[\alpha]_D^{18}$  36.72° (max. value observed). The base liberated from (*a*) by treatment with alkali and extn. with  $Et_2O$  yields with alc. HCl a *hydrochloride*, m.  $179.5^\circ$ , with  $[\alpha]_D^{18}$  34.80°. The *l*-hydrochloride obtained from the mother liquors shows  $[\alpha]_D^{18}$   $-17.07^\circ$ . To 200 g. (*a*) in not too much  $H_2O$  at about  $10^\circ$  is slowly added 100 g.  $NaNO_2$  in  $H_2O$ , the soln. (from which much salt has sepd.) is extd. 5-6 times with  $Et_2O$  and the ext. is dried with  $Na_2SO_4$  and fractionated, yielding 40 g. *d*-chloro- $\alpha$ -propanol (*b*) (despite repeated distns. the alc. cannot be obtained quite pure; the Cl content is always too low), b.p.  $40-1^\circ$ , d. 1.1122,  $[\alpha]_D^{18}$  9.26°. The purest *l*-antipode so far obtained showed d. 1.1122,  $[\alpha]_D^{18}$   $-2.92^\circ$ . *dl*- $\beta$ -Bromopropanol was also prepd.; as the tartrate of the amine (except in 1 single case) could not be made to cryst., the use of the Br compds. in the attempt to prep. active derivs. was given up. To 0.5 part KOH in 2 parts  $H_2O$  at about  $50^\circ$  in a distg. flask connected with an iced- $H_2O$  condenser and a receiver in a

freezing mixt. is added, not too slowly, 23 g. (b) and the flask is rapidly heated to 70°; there is thus obtained 10 g. *d*-propylene oxide (c), b. 36.5–8.0°, d. 0.8412,  $[\alpha]_D^{18}$  12.72°. The purest *l*-compound so far obtained showed d. 0.8412,  $[\alpha]_D^{18}$  –8.26°. (c) is added dropwise to cold anhydrous HCO<sub>2</sub>H, allowed to stand 2–3 hrs., freed from excess of HCO<sub>2</sub>H *in vacuo*, treated with 15% HCl, hydrolyzed by allowing to stand 1 hr. at 50° with frequent shaking, concd. *in vacuo* below 40°, treated with H<sub>2</sub>O and concd. repeatedly until all the HCl is removed and fractionated; the *d*-propyleneglycol (d) b<sub>14</sub> 95°,  $[\alpha]_D^{18}$  13.71° (H<sub>2</sub>O); *l*-compound,  $[\alpha]_D^{18}$  –8.97°. On standing in H<sub>2</sub>O or heating with H<sub>2</sub>O, the glycol is extensively racemized, sometimes yielding a weakly *d*-, sometimes a *l*-rotatory product; at present no satisfactory explanation of this can be offered. *d*-Propyleneglycoldibutyryn, from (d) in CHCl<sub>3</sub> and 6 parts PrCOCl at 50°, b<sub>14</sub> 95–105°,  $\alpha$  2.05° in a 1 dcm. tube.  $\beta$ -Bromoisopropyl alcohol (e), from 20 g. (c) slowly added to 30 cc. HBr (d. 1.49) in 80 cc. cold H<sub>2</sub>O and allowed to stand 0.5 hr. (yield, 25 g.), b<sub>14</sub> 45–50°,  $\alpha$  –2.02° in a 1 dcm. tube; the *l*-form of (c) gave an alcohol with  $\alpha$  1.15°. From 5 g. (e) in 20 cc. alc. boiled with 5 g. KCN is obtained 4 g. of  $\beta$ -hydroxybutyronitrile (f), b<sub>14</sub> 99–100°,  $[\alpha]_D^{18}$  –10.03°, while the *d*-rotatory (e) from the *l*-rotatory (c) gave a nitrile with  $[\alpha]_D^{18}$  8.78°. On heating several hrs. on the H<sub>2</sub>O bath with concd. HCl, (f) gives the acid,  $[\alpha]_D^{18}$  –13.28°. From 15.5 g. (b) allowed to stand 24 hrs. with 50 g. (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> in 48 cc. concd. H<sub>2</sub>SO<sub>4</sub> and 320 cc. H<sub>2</sub>O is obtained an  $\alpha$ -chloropropionic acid with  $\alpha$  –2.25° in a 2 cm. tube; this allowed to stand 14 days with aq. NH<sub>4</sub>OH, then shaken with Ag<sub>2</sub>SO<sub>4</sub>, pptd. with exactly the calcd. amt. of HCl, then with Ba(OH)<sub>2</sub>, evapd. *in vacuo*, and extd. with alc. to remove any MeCH(NH<sub>2</sub>)CH<sub>2</sub>OH, yields a residue (alanine) which in dil. HCl is strongly *l*-rotatory. CHAS. A. ROUILLER.

The freezing points of mixtures of phenol, *o*-, *m*- and *p*-cresol (DAWSON, MOUNTFORD) 7. Aktie Selskabet Karbidindustri (acetic acid and alcohol from calcium carbide) (ANON.) 4. Critical phenomena (FIELDING) 2. The chemistry of sweetening agents (BARRAL, RANC) 12. Some physical constants of "mustard gas" (ADAMS, WILLIAMSON) 2.

**Sulfonic acids.** J. E. SOUTHCORBE and R. M. DOWNIE. Brit. 120,405, Sept. 7, 1917. The mixt. of naphthalenesulfonic acids with H<sub>2</sub>SO<sub>4</sub> obtained by the sulfonation of naphthalene, is worked up by first partially neutralizing the mass with an alkali (Na<sub>2</sub>CO<sub>3</sub> or NaOH) and completing the neutralization by adding CaO; the CaSO<sub>4</sub> is filtered off, any excess of lime is pptd. by Na<sub>2</sub>CO<sub>3</sub>, and the resulting soln. of Na naphthalenesulfonates filtered.

**Derivatives of hydroxyarylquinolinedicarboxylic acids.** FARBW. VORM M. L. & B. Ger. 305,885, addition to 293,467, 1918 (C. A. 11, 2581). Derivs. of isatic acid, substituted in the nucleus, are condensed with acetylsalicylic or acetylcresotic acids. Thus, hydroxytolylquinolinedicarboxylic acid, orange powder, decomp. above 280°, is prepd. by warming 5-methylisatin with *p*-acetylsalicylic acid in the presence of KOH and H<sub>2</sub>O. Similarly, 5,6-methylenedioxyisatin and *p*-acetylsalicylic acid yields a quinolinedicarboxylic acid, yellow powder. The product obtained from *p*-methylisatin and acetyl-*p*-cresotic acid is a yellowish red powder, which decomposes at 290°. 6-Bromo-4'-hydroxyphenylquinoline-4,3'-dicarboxylic acid, yellow powder, decomp. at about 273°, results from 5-bromoisatin and *p*-acetylsalicylic acid.

**Glycolyl-*p*-aminophenyl ethers.** FARBWERKE VORM. M. L. & B. Ger. 306,938, 1918. Glycolyl-*p*-aminophenyl ether is obtained in excellent yield and in a high state of purity by heating *p*-aminophenyl ether with the glycolic anhydrides; the latter are considered to comprize glycolide, m. 86°, polyglycolide, m. 223°, and the product formed when glycolic acid is heated at about 200–250°, which consists of a cryst. pow-

der insol. in  $H_2O$ , by which it is slowly converted into glycolic acid. Esters of glycolic acid can be used in place of the anhydrides. Glycolyl-*p*-phenetidine forms colorless crystals, m.  $153^\circ$ ; glycolyl-*p*-anisidine, m.  $101^\circ$ .

1-Hydroxy- and 1,8-dihydroxyanthranol. BAYER & Co. Ger. 305,886, addition to 296,091, 1918 (cf. C. A. 13, 323). The alkyl ethers of 1-hydroxy- and 1,8-dihydroxyanthraquinones are reduced by Zn in acid soln. in the place of the parent substances. The Me ethers are cited as examples.

Hydrogenated compounds. BAYER & Co. Ger. 306,724, addition to 305,347, 1918 (C. A. 13, 325). Other aromatic isocyclic and heterocyclic compds., in addition to bases, can be reduced with alkali or alk.-earth metals and alc. in the presence of an indifferent solvent. The process is easily regulated and can be stopped at any point by withholding further addition of alc. Thus, tetrahydronaphthalene is obtained from naphthalene, Na, and alc. in the presence of solvent naphtha at  $140-5^\circ$ , and tetrahydridiphenyl, b.  $247-9^\circ$ , b<sub>10</sub>  $115-8^\circ$ , from diphenyl, Na, alc., and solvent naphtha at  $140-50^\circ$ . Acenaphthene yields tetrahydroacenaphthene.

## II: BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

A. GENERAL.

FRANK P. UNDERHILL.

The laboratory in the service of the hospital. C. H. BROWNING. *Nature* 102, 295-7(1918).—A discourse. W. H. ROSS.

Researches on the microchemistry and the genesis of amyloid. ERNST LEUPOLD. Univ. of Würzburg. *Beitr. path. Anat.* 64, 347-400(1918).—From a review of the literature and from exptl. work which is reported the author makes the following conclusions: Amyloid is a complex of different substances which are differentiated by microchem. reactions. The protein ground substance of the amyloid is refractory to the typical amyloid reactions. The group which is responsible for the methyl-violet reaction is intimately combined with this protein substance and is sepd. from it only by the action of alkali. The groups which give, respectively, the I and the  $I-H_2SO_4$  reactions are closely related to each other. Nevertheless the  $I-H_2SO_4$  reaction is a completely independent one and is not a modification of the I reaction. The occurrence of different colors in the  $I-H_2SO_4$  reaction depends upon different degrees of oxidation. Amyloid is an emulsion colloid in the gel state. After oxidation with  $KMnO_4$  it is sol. in  $NH_4OH$ , NaOH and  $Ba(OH)_2$ . Conjugated  $H_2SO_4$  plays an important part in the production of amyloid in the organism. The existence of large amts. of conjugated  $H_2SO_4$  produces amyloid which gives the  $I-H_2SO_4$  reaction. The methyl-violet reaction also depends on the presence of conjugated  $H_2SO_4$ ; however, for its production there must probably occur a reduction to amyloid protein. The group which gives the  $I-H_2SO_4$  reaction occurs through decompn. and does not depend upon the  $H_2SO_4$ . In chronic suppuration a sol. protein circulates in the blood which is removed by ferments. This protein substance, under certain conditions, is deposited in organs where large amts. of  $H_2SO_4$  occur. For the development of amyloid there are necessary 3 factors, a pre-formed protein, an increased amt. of  $H_2SO_4$ , and an inefficiency of the amyloid-filled organ to eliminate the increased amt. of conjugated  $H_2SO_4$ . JULIAN H. LEWIS.

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MENGE, EDWARD J.: **The Beginning of Science, Biologically and Psychologically Considered.** Boston: Richard G. Badger. 256 pp. \$2.00 net. For review see *J. Am. Med. Assoc.* 72, 301(1919).

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WITTHAUS, RUDOLPH AUGUST: **Text-book of Chemistry, Inorganic and Organic, with Toxicology; for Students of Medicine, Pharmacy, Dentistry and Biology.** 7th revized Ed. by R. J. E. Scott. New York: W. Wood & Co. 477 pp.

### C. BACTERIOLOGY.

**Studies on synthetic mediums. I. Study of the characteristics of some bacteria on a simple synthetic.** FLORENCE HULTON-FRANKEL, HELENE BARBER AND ELEANOR PYLE. Columbia Univ., N. Y. *J. Infect. Dis.* 24, 9-16(1919).—The synthetic medium used had the following compn.: 129.5 cc. of  $M$   $H_2PO_4$ , 18 cc. of  $M$   $CH_3COOH$ , 17.8 cc. of  $M$   $NH_4OH$ , 100 cc. of  $M$   $KOH$ , 100 cc. of  $M$   $NaOH$ , 10 cc. of 0.01%  $FeCl_3$ , 10 cc. of 0.01%  $MgSO_4$ , 10 cc. of 0.01%  $CaCl_2$  per l. The H-ion concn. was  $10^{-7}$ . This medium is suitable for the growth of most saprophytic organisms and also for some of the facultative parasitic organisms. None of the characteristics of growth was lost and one property was increased. **II. Sugar fermentation in synthetic medium.** FLORENCE HULTON-FRANKEL AND HELENE BARBER. *Ibid.* 17-8.—To the above synthetic medium dextrose, sucrose, lactose and maltose 1% were added, and the fermentation of these sugars by 60 different organisms was studied. Only 3 of the organisms failed to produce acid or gas when they did so in broth. **III. Some animal experiments with organisms grown on synthetic medium.** FLORENCE HULTON-FRANKEL AND ELEANOR PYLE. *Ibid.* 19-21.—The object of this investigation was to find out if some of the organisms grown on the above synthetic medium had changed in their behavior toward animals. The organisms chosen were *B. mucosus* (Friedlander's bacillus), *Microspira cholerae*, and *B. typhosus* (Hopkins' strain). The first 2 were tried for virulence and the typhoid for the production of antibodies. *B. mucosa* and *B. typhosus* remained unchanged in their effect on animals. However, the synthetic medium lacks something necessary to produce the substance responsible for the pathogenicity of *Microspira cholerae*.

JULIAN H. LEWIS.

**The resistance of the glanders bacillus to calcium hypochlorite (chloride of lime).** BARNETT COHEN. Yale Univ. of Med., New Haven, Conn. *J. Infect. Dis.* 24, 51-5 (1919).—When compared to *B. coli*, *B. mallei* is, if anything, more sensitive toward  $CaOCl_2$  in concns. employed for the disinfection of  $H_2O$  supplies.  $CaOCl_2$  may be effectively used in the disinfection of horse troughs as a harmless prophylactic measure in glanders-infected regions.

JULIAN H. LEWIS.

EBERSON, FREDERICK: **A Bacteriologic Study of the Diphtheroid Organisms with Special Reference to Hodgkin's Disease.** New York: Columbia University. 56 pp.

FOX, HERBERT: **Elementary Bacteriology and Protozoölogy for the Use of Nurses.** 3rd Ed., thoroughly revized. Philadelphia and New York: Lea & Febiger. 222 pp. \$1.75. Cf. *C. A.* 8, 946.

JORDAN, EDWIN O.: **A Text-Book of General Bacteriology.** 6th Ed. Philadelphia: W. B. Saunders Co. 691 pp. \$3.75 net. For review see *J. Am. Med. Assoc.* 72, 517(1919); cf. *C. A.* 7, 497; 9, 94; 12, 380.

WEST, G. S.: *Algae*. Vol. I. *Myxophyceae, Peridiniaceae, Bacillariaceae, Chlorophyceae*. London: Cambridge Univ. Press., Fetter Lane, E. C. 4. 475 pp. 25s. For review see *Rev. sci.* 56, 352(1918).

#### D. BOTANY.

CARL L. ALSBERG.

**Chemical correlation in the growth of plants.** W. M. BAYLISS. *Nature* 102, 285-7(1918).—A review of the exptl. work of Loeb on the chem. basis of regeneration and geotropism in plants (*Botan. Gazette* 60, 249(1915); 63, 25(1917); 65, 150(1918); *Science* 66, 115, 547(1917); *Proc. Nat. Acad. Sci.* 4, 117(1918)). The greater growth of the apical buds of plants relative to the lateral buds of the stem is explained on the assumption that when the leaves are first removed, inhibitory substances are present everywhere throughout the stem, but that these have a tendency to flow towards the base. Hence the most apical node is the first one to become freed from their presence, and when its buds grow they form anew the inhibitory substance which prevents the growth of the more basal buds. Evidence is given to show that the inhibitory effect is proportional to the size of the growing apical bud.

W. H. ROSS.

**Physiological studies of normal and blighted spinach. Ash content in normal and in blighted spinach.** R. H. TRUE, O. F. BLACK AND J. W. KELLY. *J. Agr. Research* 15, 371-5(1918).—The total ash of healthy spinach tops is higher than that of blighted plants, while diseased roots have a higher ash content than the normal ones. The proportion of Si present is but little affected by health or disease either in tops or roots. The tops contain several times as much Si as the roots. Ca is localized in the leaves in greater quantity than in the roots in both normal and blighted plants. Mg is higher in both tops and roots in the blighted plants than in the normal ones. The K content is high; normal tops contain 5.93% and the diseased ones 4.08%. Na is found in less amts. than K in the tops, but this is reversed in the roots in some cases. The healthy spinach tops contain an av. of 0.132% Fe, based on dry plant, against 0.095% in the blighted tops. The roots of the diseased plants contain an av. of 0.122% Fe; the normal amt. was 0.065%. It seems that a part of the Fe that entered the plant through the roots accumulated there instead of going up through the leaves as in the normal plants. **Oxidase reaction in healthy and in blighted spinach.** H. H. BUNSELL. *Ibid* 377-80.—The stunting of the plant by disease caused an increased oxidase mechanism. In all but a few instances, there was a difference of 50-100% between the activity of the diseased and of the healthy plant. **Carbohydrate production in healthy and in blighted spinach.** R. H. TRUE AND L. A. HAWKINS. *Ibid* 381-4.—Carbohydrates accumulate in the leaves of plants affected with the spinach-blight in larger quantities than in normal leaves. The starch content of the diseased tops is more than double that of the normal plant. In the roots total sugars and starch are alike in both. It is considered that the cause of the injury "does not affect the machinery of photosynthesis or the materials used in carbohydrate manuf. to such an extent as to stop production. It is indicated that carbohydrate accumulation is due not to a breakdown of digestion but to some partial failure in the subsequent metabolic processes in connection with which carbohydrates are used." **Nitrogen metabolism in normal and in blighted spinach.** S. L. JODIDI, E. H. KELLOGG AND R. H. TRUE. *Ibid* 385-404.—The N content of the healthy plant is higher than in the corresponding diseased tissues, but the N of the diseased roots is higher than of healthy ones. The lower % of total N and of acid amide N in the diseased material can best be explained by the assumption that denitrification takes place in those tissues, whereby part of the N may be lost either as elementary N or in the form of  $\text{NH}_3$ . There is a higher proportion of ammoniacal N in the diseased plant than in the normal, which is probably accounted

for in the process of denitrification, whereby a part of the nitrites is further reduced to  $\text{NH}_3$ . J. J. SKINNER.

BONNIER, G., AND LECLERC DU SABLON: *Cours de botanique. Phanérogames. Nouveautrage corrigé*. Paris: Librairie générale de l'Enseignement, 1 rue Dante. 1328 pp. 20 francs plus majoration. For review see *Rev. sci.* 56, 350(1918).

#### F. PHYSIOLOGY.

ANDREW HUNTER.

The fractional examination of the duodenal contents. MAX EINHORN. *Am. J. Med. Sci.* 156, 817-30(1918).—Examn. of the duodenal contents  $1\frac{1}{2}$  hrs. after a bouillon meal gives the pancreatic juice at the height of its activity. Fasting states give the best results for liver and biliary lesions. Alkalinity is estd. as an index of pancreatic efficiency. Agar tubes were used to det. pancreatic enzyme activity.

W. MORSE.

Glucolysis in the blood. J. HEKMAN AND A. VAN MEETEREN. *Nederlandsch Tijdschrift voor Geneeskunde* 2, 497(1918); *J. Am. Med. Assoc.* 71, 1868.—A micro-method based on the Bang technic is described with which it is possible to est. the sugar-splitting property of the blood. The expts. showed that the glucolysis in the blood is no index of pancreas functioning. The sugar-splitting coeff. is the quotient obtained by dividing the number representing the amt. of sugar in the blood by the number representing the glucolysis. This coeff. varies from 0.7 to 1.5 in normal persons. In diabetes this coeff. may run up to 6 or more.

L. W. RIGGS.

#### G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

Antibodies in the fetus. HAL W. SHERMAN. John McCormick Inst. for Infect. Dis., Chicago. *J. Infect. Dis.* 24, 1-8(1919).—This paper is a study of the natural antibodies of swine embryos. In the youngest embryo studied the amt. of complement and lysins for various red cells was inappreciable. Opsonins were present but averaged only 0.04 as measured by the opsonic index. Complement and opsonins increase as the age of the fetus increases. Lysins do not appear to increase. In the amniotic fluids complement is only occasionally found; lysins and opsonins resemble closely those of the fetal serums. The conclusion of Polano and Goldmann from their work, respectively, on antitoxins and vital stains, that the amnion has a selective secretory action, seems to be unwarranted. The theory of the transudation of the amniotic fluid from the maternal serum is untenable. The amniotic fluid is probably derived almost exclusively under normal conditions as a transudation from the cord and as a secretion from the surface of the fetus. In the allantoic fluids complement was found only in the younger embryos. Lysins are found more prevalent in the earlier fluids but to a small extent also in the later ones.

JULIAN H. LEWIS.

A comparison of six different antigens in the Wassermann reaction. E. H. RUDRIGER. Bismarck, N. D. *J. Infect. Dis.* 24, 31-44(1919).—Because many different kinds of antigen are being used in the Wassermann reaction 6 different kinds of antigen were subjected to comparative study. The antigens studied were alc. ext. of human heart muscle, alc. ext. of syphilitic fetal liver, alc. ext. of dog heart muscle, alc. ext. of sheep heart muscle and acetone-insol. antigen of sheep heart muscle. Antigen supposed to be alc. ext. of syphilitic fetal liver and antigen prepd. from dog heart gave many more positive results than did alc. ext. of human heart. As no other signs or symptoms of syphilis could be detected these were considered false positive results, and these antigens were discarded as unreliable. Antigen prepd. from sheep heart gave results almost identical with those given by antigen prepd. from human heart. The glycerol added to the human serum cannot be held responsible for the false positive results

obtained. Previous absorption of the natural antidog amboceptor from the human serums did not eliminate the false positive results. Antigen dild. with the salt soln. slowly so as to give an opalescent soln. gave many more positive results with the Wassermann test than did antigen which was dild. rapidly enough to give a clear soln. Adding the antigen to the human serum before the complement gave results identical with those obtained when the complement was added before the antigen. J. H. LEWIS.

**Transmissibility of immunity from mother to offspring in hog cholera.** CLIFFORD L. MCARTHUR. Ark. Expt. Sta. *J. Infect. Dis.* 24, 45-50(1919).—Sows immunized against hog cholera by the Dorset-Niles method transmit this immunity to their offspring. In nearly every case the pigs retained their immunity as long as they were suckling and the sow was immune. When the mother contracted the disease the pigs did not usually survive more than a few days, and in some instances cholera lesions were found on necropsy. These facts seem to indicate that the antibodies are transmitted through the milk during the entire suckling period. JULIAN H. LEWIS.

**Agglutination in measles.** RUTH TUNNICLIFF. (Chicago), Contract Surgeon, U. S. A. *J. Infect. Dis.* 24, 76-7(1919).—Expts. show that a distinct increase in agglutinins for the diplococci isolated from measles blood occurs in measles on the 3rd to the 8th day following the appearance of the eruption. The agglutination appears to be sp. for the measles diplococcus, no agglutinins being observed for pneumococcus types I and II, and *Streptococcus hemolyticus*. The agglutinins are present in the blood when the opsonic power is at its height and when complement-fixing bodies are demonstrable. JULIAN H. LEWIS.

**Studies in cholelithiasis. III. The immediate effect of operations upon the cholesterinemia.** ABRAHAM O. WILENSKY AND MARCUS A. ROTHCHILD. *Am. J. Med. Sci.* 156, 564-74(1918); cf. *C. A.* 13, 340.—The blood cholesterol content is modified after cholecystectomy only where complications arise. Where obstructions are removed, the cholesterol content becomes normal. W. MORSE.

**Reinfection with *Streptococcus hemolyticus* in lobar pneumonia, measles and scarlet fever and its prevention.** LOGAN CLENDENING. *Am. J. Med. Sci.* 156, 575-86(1918).—Reviews of the work of Cole and McCallum, of Irons and Marine, of Hamburger and Mayers of Cummings, and of Spruit and Lynch, who reported from various camps in the United States. Carriers are responsible, in the wards; hence isolation is resorted to. W. MORSE.

**Fat redistribution in the hypophyseal type of dystrophy adiposogenitalis.** HARVEY G. BECK. *Am. J. Med. Sci.* 156, 711-20(1918).—Return to practically normal dimensions of the buttocks and thighs occurred in several cases of females following administration of hormatone and of thyroid. The diet remained unchanged. The fate of the redistributed fat was not detd. W. MORSE.

**Complement fixation in Hodgkins disease and allied infections.** H. T. KRISTJANS. *Am. J. Med. Sci.* 156, 720-5(1918).—Using *B. hodgkini*, a positive, sp. reaction may be given. Exptl. animals give a sp. reaction. The limited number of normal cases examd. gave no reaction. W. MORSE.

**Certain aspects of the clinical value of the estimation of kidney function.** EDWARD H. MASON. *Am. J. Med. Sci.* 156, 830-8(1918).—A test meal should be examd. correlative with the rate of urea excretion, chlorides and phenolsulfonephthalein. Digitalis lowers the threshold for chlorides. W. MORSE.

**Alkaline reserve content of blood serum in wounded soldiers.** EDGARD ZUNZ. *Compt. rend. soc. biol.* 81, 144-6(1918).—The Marriott method for detg. the alk. reserve content of blood serum was employed. In general, a decrease in alk. reserve of the serum of wounded soldiers was observed in cases of relatively

pronounced infection, diminished respiration due to insufficient oxygenation and in serious intestinal intoxication. *Streptococcus* and *B. perfringens* were almost always present in infections which were accompanied by pronounced acidosis. Alkaline reserve values of 7.9-8.2 and 7.7-8.2 were noted in streptococcic septicemia and serious gaseous gangrene, resp. The alk. reserve content was normal in cases of contusion and closed fracture without fever or infection; the same was true in cases of open fracture and wounds (even multiple) of the fleshy parts of the body, provided there was no fever or infection. The periods of min. content of alk. reserve coincided with the max. of infection and also with the periods of max. leucocyte content of the blood. The alk. reserve content may, however, return to normal while the leucocyte content of the blood is still high and before the infection has entirely disappeared. Only moderate acidosis was noted in staphylococcic septicemia, the values of alk. reserve content being 8.1-8.3. Broncho-pneumonia was accompanied by notable decrease in alk. reserve. In conditions of circulatory collapse detd. by hemorrhage or infection during the 1st few hrs. following infliction of the wound the alk. reserve content decreased considerably (to 7.6-7.95). In the case of intoxication by asphyxiating gases or gases with irritant action on the tracheo-bronchial mucosa the alk. reserve content either remained normal or decreased only slightly; in cases of the foregoing where broncho-pneumonia or pulmonary edema ensued the alk. reserve content decreased to 7.5-7.9. The prognosis is generally unfavorable in all cases in which the alk. reserve content of the serum is less than 7.8. H. S. PAINE.

**Antitryptic index of the blood serum of wounded soldiers.** EDGARD ZUNZ AND PAUL GOVAERTS. *Compt. rend. soc. biol.* 81, 146-8(1918).—Contusions and minimal closed fractures have a negligible influence on the antitryptic index of the serum. Closed fractures of the limbs may cause a transitory increase; the latter may be detd. by other factors than infection and has sometimes a purely traumatic origin. In wounds where the infection remains superficial and does not cause fever the modifications of the antitryptic index follow the same course (with the same amplitude) as in aseptic lesions; they appear to depend on the initial traumatism. In febrile conditions the antitryptic index attains a distinctly higher value than in cases where no fever ensues; the curves of temp. and antitryptic index are parallel in their general course. The value of the antitryptic index in the wounded is dependent on 2 principal factors, i. e., the initial traumatism and the degree of fever. The intervention of these factors probably explains the frequent flattening of the antitryptic curve after 10-15 days in patients with infected wounds, this change being then followed by another rise in the curve; this flattening of the curve doubtless corresponds to the period when the influence of the initial traumatism ceases to be effective. Increase in antitryptic index may be entirely absent in conditions of circulatory collapse detd. by hemorrhage or infection during the 1st few hrs. following infliction of the wound. The same is true in septicemia (*streptococcus*, *staphylococcus*, *B. perfringens*). In some cases the antitryptic index only increases in gaseous gangrene at the moment when the virulence of the infection appears to diminish. Intoxications due to asphyxiating or lachrymal gases cause little or no change in the antitryptic index. In the evolution of an infected wound the curve of leucocytosis and that of the antitryptic index are only parallel during the 1st few days of the infection. No parallelism between the variations in antitryptic index and the variations in the alk. reserve content of the serum was observed. A table is given showing the max. values of the antitryptic index in various pathol. conditions. The highest values were found in cases of wounds, open fractures, crushed limbs, etc., accompanied by prolonged infection and fever. H. S. PAINE.

**Oxidotherapy in the treatment of tetanus.** M. BGLIN. *Compt. rend. soc. biol.* 81, 172-4(1918); cf. *C. A.* 12, 722.—The term "oxidotherapy" is applied by B. to the



treatment of various diseases by injection (subcutaneous, intramuscular, intravenous) of oxidizing agents (such as  $\text{KClO}_3$ ,  $\text{KMnO}_4$ , etc.). Gradual disappearance (complete after 30-45 min.) of contractions was observed after injection of 2 cg. per kg. of  $\text{KClO}_3$  (1:40 soln.) in a rabbit on the day following injection of 1.5 cc. of a 36-hr. culture of tetanus bacilli (in peptone broth) in the region of the shoulder. The action of oxidizing agents was *nil* in the case of generalized contractions. General amelioration of symptoms was noted in horses with tetanus after successive injections of 1:250 or 3:1000  $\text{KMnO}_4$  solns.

H. S. PAINE.

**Respective roles of serine and globulin in the sigma reaction.** LOUIS BORY. *Compt. rend. soc. biol.* 81, 247-8 (1918).—Since a positive sigma reaction is still obtained when a horse globulin soln. in appropriate amt. is substituted for sp. serum in the required system excess of globulin may be regarded *a priori* as a characteristic of the sp. sera. B. has investigated the behavior of serine under the same conditions. Serine was found to cause fixation of complement (guinea pig complement and Desmoulières antigen), but this likewise occurred in the absence of antigen. Similar results were obtained when serine in increasing amts. was added to a sigma-negative serum in a complement fixation expt. Globulin, on the contrary, only transformed the negative serum into a positive serum in the presence of antigen; this change was proportional to the increase in concn. of globulin. The serum appeared, however, to contain a substance which opposed the fixative power of globulin in the presence of antigen; this was shown by comparison of the usual system with the same system after omission of the negative serum. This substance is apparently serine; globulin and serine appear to play opposite roles in the Wassermann reaction.

H. S. PAINE.

**Constancy of alexin in the blood stream; deplementized sera.** RENÉ BENARD. *Compt. rend. soc. biol.* 81, 281-2 (1918).—Complement was invariably found to be present in approx. 300 sera which were investigated by collecting the blood in an oxalate soln., centrifuging and bringing the supernatant plasma in contact with an inactivated hemolytic system. On the other hand the sera obtained from these same samples of blood after coagulation were found to be practically devoid of complement in 18% of the cases, disappearance of complement having occurred within 13-20 hrs. after withdrawal of the blood; hemolysis was absolutely *nil* in 11% of these cases and very slight in 7%. The difficulty due to possible use of sera devoid of complement in simplified Wassermann procedures may be avoided by using oxalated plasma. Sera may become more or less deplementized, but sera naturally devoid of complement do not occur.

H. S. PAINE.

**Investigation in horses with typhoid affections of agglutinins and the sensitizing substance corresponding to the equine paratyphoid bacillus.** RAOUL COMBES. *Compt. rend. soc. biol.* 81, 288-91 (1918); cf. *C. A.* 12, 1989.—In addition to the equine streptococcus there were found in the lesions presented by horses and mules with typhoid affections a bacillus (I) of the paratyphoid group and a bacillus (II) of the *Pasteurella* type (but rapidly producing indole in peptone media); C. designates I as "equine paratyphoid bacillus." The sera of healthy horses, of horses with non-typhoid affections and of horses with typhoid affections (bacillus II present and I absent) failed to agglutinate bacillus I at dilns. greater than 1:100. The sera of horses with typhoid affections (bacillus I present) agglutinated this bacillus at high dilns. (max. 1:4000); the sera of these horses contained the sensitizing substance (complement fixation) corresponding to this bacillus. Horses with typhoid affections may by the above serum reactions be sepd. into 2 groups, *i. e.*, (1) those which are and (2) those which are not carriers of the equine paratyphoid bacillus.

H. S. PAINE.

**Determination of sugar in the cerebrospinal fluid; semeiological value of hyperglucorachia.** MATHIEU-PIERRE WEIL. *Compt. rend. soc. biol.* 81, 364-7 (1918).—

Change in content of glucose is the most sensitive indication of modification of the cerebrospinal fluid; this change precedes all others, especially increase in albumin content. Detn. of sugar should be effected immediately after withdrawal of the cerebrospinal fluid; otherwise the sugar content may be diminished by bacterial action (pathol. or accidental infection) or it may be increased in the case of cerebrospinal fluid rich in cellular elements (possibly through liberation from the latter of carbohydrate groups of the nucleoprotein content). Samples which cannot be examd. at once should not only be kept under aseptic conditions but should also be centrifuged to remove cellular elements. The methods of Grimbert and Bertrand are recommended for detn. of sugar. The difficulty encountered with the latter method owing to the relatively small vol. of cerebrospinal fluid available and the amt. (10-100 mg.) of glucose required to be present in order to secure a satisfactory detn. may be obviated by adding to the clarified fluid an accurately known amt. (e. g., 10 mg.) of glucose before making the detn. The sensitiveness of the Bertrand method is increased by using a 1.25:1000 instead of the 5:1000 KMnO<sub>4</sub> soln. recommended by B. The normal sugar content of the cerebrospinal fluid is 0.46-0.52 g. per l.; values lower than 0.40 g. and higher than 0.60 g. per l. are pathol. Hyperglucorachia was observed in a no. of patients with paralytic syndromes due to lesion of the central nervous system and also in cases of sciatic neuritis and alc. polyneuritis. Change in the glucose content of the cerebrospinal fluid may be indicative of the participation of the spinal cord in many toxic-infectious conditions of the organism. Hyperglucorachia is coincident with congestion of the meninges and may be regarded as an index of the same, osmosis being facilitated by congestion. The hypothesis of hyperemia as a factor in production of hyperglucorachia is consistent with the frequently transitory character of the increase in sugar content of the cerebrospinal fluid.

H. S. PAINE.

**Hyperglucorachia of shell shock.** MATHIEU-PIERRE WEIL. *Compt. rend. soc. biol.* 81, 367-9(1918); cf. preceding abstract.—Detn. of the sugar content of the cerebrospinal fluid is of primary importance in the study of shell shock for the purpose of differentiating between purely nervous manifestations and those which have an organic basis. In the latter case values of 0.61-0.77 g. per l. were encountered, while in the former case the values were normal (0.44-0.49 g. per l.). In most cases of shell shock the cerebrospinal fluid showed no abnormality other than increase in sugar content. The congestion in cases of shell shock with organic basis may result only in hyperglucorachia or it may be sufficient to produce meningeal hemorrhage.

H. S. PAINE.

**Conditions of circulatory collapse.** P. GOVAERTS AND E. ZUNZ. *Compt. rend. soc. biol.* 81, 881-4(1918).—In an investigation of the factors causing the condition of circulatory collapse during shock G. and Z. studied the changes in alk. reserve by the method of Marriott. When arterial pressure was less than 50 mm. Hg the alk. reserve of the serum diminished, regardless of the cause of circulatory collapse; this decrease appeared more quickly and was more pronounced when the decrease in pressure was due to acute infection. Removal of a leg (exptl. study of traumatic circulatory collapse in dogs) caused no distinct change in the alkaline reserve. The latter diminished whenever a condition of low pressure was produced by a combination of traumatism and moderate hemorrhage. In no case did it appear that decrease in alkaline reserve could be regarded as a cause of circulatory collapse.

H. S. PAINE.

**Value of modern blood chemistry to the clinician.** A. O. GETTLER AND A. V. ST. GEORGE. New York. *J. Am. Med. Assoc.* 71, 2033-6(1918).—Following are a part of the conclusions based upon a study "of some 15000 detns., the largest ever reported." Kidney function may be ascertained by the increased values of non-protein N, urea N, creatinine, and uric acid; that is, whether a derangement of the elimination of the

waste N products exists. The severity of this derangement can be ascertained and the prognosis detd. Hyperglucemia can be detected with certainty by the increased value of the blood sugar content, even in the earliest stages of diabetes, when the urine is still free from sugar. Acidosis and its degree can be detd. by the decreased value of alk. reserve of the blood as measured by the Van Slyke CO<sub>2</sub> app. By reducing in the blood of the patient the precursor of the particular substance formed in excessive amts. in the blood, good results are obtained. L. W. RIGGS.

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CHALIER, A. AND CHALIER, J.: *La gangrène gazeuse.* Paris: Librairie Félix Alcan. 388 pp. 8 francs 50. For review see *Rev. sci.* 56, 287(1918).

CRAIG, CHARLES F.: *The Wassermann Test.* St. Louis: C. V. Mosby Co. 239 pp. \$3.00. For review see *J. Am. Med. Assoc.* 72, 369(1919).

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LAVERAN, A.: *Leishmanioses.* Paris: Masson et Cie. 521 pp. 15 francs. For review see *Rev. sci.* 56, 124(1918).

LOCKYER, CUTHBERT: *Fibroids and Allied Tumors (Myoma and Adenomyoma): Their Pathology, Clinical Features and Surgical Treatment.* Introductory Notice by Alban Doran. New York: Macmillan Co. 603 pp. 225. For review see *J. Am. Med. Assoc.* 71, 1243(1918).

PEARCE, RICHARD MILLS, KRUMBHAAR, EDWARD BELL AND FRAZIER, CHARLES HARRISON: *The spleen and anemia.* Philadelphia: J. B. Lippincott Co. 419 pp. \$5.00. For review see *J. Am. Med. Assoc.* 72, 369(1919).

PRON, M.: *Le contenu stomacal a jeun a l'état pathologique et les catarrhes gastriques.* Paris: Maloine. 44 pp. 2 francs 20. For review see *Rev. sci.* 56, 572(1918).

RAVAUT, PAUL: *Syphilis, paludisme, amibiase: Traitement initial et cure de blanchiment.* Preface by Fernand Widai. Paris: Masson & Cie. 88 pp. 4 francs. For review see *J. Am. Med. Assoc.* 72, 517(1919).

THOMAS, B. A. AND IVY, R. H.: *Applied Immunology.* 2nd Ed. London: J. B. Lippincott Co. 364 pp. 18s. For review see *Rev. sci.* 56, 447(1918); cf. *C. A.* 9, 3295.

WEINBERG, M. AND SÉGUIN, P.: *La gangrène gazeuse; bactériologie, reproduction expérimentale, sérothérapie.* Paris: Masson et Cie. 442 pp. 20 franc. For review see *Rev. sci.* 56, 350(1918).

## I. ZOÖLOGY.

R. A. GORTNER.

Suggestions regarding the causes of bioelectric phenomena. L. H. HYMAN. *Science* 48, 519-24(1918).—H. reviews the work of Child, Lillie, Waller, Tashiro and many others. Following are some of the suggestions and conclusions: The electrical difference of potential in the organism is due to the difference in rate of oxidation at different levels. The stimulation of injury produces in the organism an increase in the metabolic rate; hence it is argued that the current of injury arises through the fact that the site of injury and adjacent regions are regions of increased metabolic rate and thus are electronegative to intact regions where the rate is lower. A region whose metabolic rate has been temporarily increased by stimulation is electronegative to such non-stimulated regions. The various kinds of bioelectric currents are thus conceived

as referable to differences in metabolic rate; and they are apparently merely the consequence of such differences and of no significance in themselves. The metabolic gradient also furnishes a logical explanation of the phenomena of galvanotaxis. L. W. R.

**Nature of pigmentation changes following hypophysectomy in the frog larva.** WAYNE J. ATWELL. Univ. Buffalo. *Science* 49, 48-50(1919); cf. B. M. Allen, *C. A.* 11, 1998, 3059; 12, 1083 and P. E. Smith, *C. A.* 12, 2385.—The conclusions of Allen and Smith were based upon a study of sections, while Atwell's studies were made upon pieces of skin of *Rana sylvatica* mounted entire. When hypophysectomized tadpoles which had reached the silvery appearance were placed in a dil. ext. of pars intermedia of beef pituitary or in an emulsion made by shaking a few mg. of dried pars intermedia in 100 cc. of water, the silvery appearance changed to dark so that they resembled normal tadpoles. The change began to be apparent in 15-30 min. and attained a max. in 1 to 3 hrs. depending upon the concn. of the emulsion employed. When returned to fresh water the silvery appearance was regained in 1 to 3 hrs. This proves that the silvery appearance is not due to loss of pigment but to a sustained contraction of the pigment-bearing cells, which may be caused to expand again by suitable stimuli. This view is supported by watching under the microscope larvae held in a Clarke's observation chamber. The final conclusion is that the change in color is primarily due to a contraction of the sub-epidermal melanophores. Only secondarily is it due to a loss in pigment granules from certain of the epidermal melanophores and to a possible migration or loss of other epidermal melanophores. L. W. RIGGS.

**Pigmentation of a clypeastroid, *Mellita sesquiporforatis* Leske.** W. J. CROZIER. *Am. Nat.* 52, 552-6(1918).—In the abstract of this article in *C. A.* 13, 343, there is an error in the page reference to the original. L. W. RIGGS.

BRACHET, A.: *L'oeuf et les facteurs de l'ontogénèse*. Paris: Doin. 349 pp. 6 francs. For review see *Rev. sci.* 56, 62(1918).

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## 12. FOODS.

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W. D. BIGELOW AND F. F. FITZGERALD.

**Jelly making with sugar savers.** LUCILE W. ADAMS AND ETHEL LOFLIN. *J. Home Econ.* 10, 503-10(1918).—Where all of the sucrose is replaced by other sweeteners as glucose, honey, corn sugar or sorghum, the jelly is darker in color and the texture less tender. However, sweeteners modify the flavor of the jelly little. The sweetening power of the various sirups varies, also their jelling point. The substitution of 50% sweeteners in place of sucrose gave the best results in most cases.

HELEN N. ELLIOTT.

**The chemistry of sweetening agents.** FRANCOIS BARRAL AND ALBERT RANC. *Rev. sci.* 56, 712-23(1918).—Taste is affected by variation of the constitution of the mol. Introduction into the mol. of a sweet substance of any radical, especially an aromatic one, destroys the sweet taste, giving a bitter one. The heavier the fixed mol., the more marked is the modification. Nitration causes disappearance of sweetness as does the introduction of halogens. Introduction of halogens into the hydrocarbons and the adding of OH to an NH<sub>2</sub> group produce a sweet taste. The methoxy group introduced into an aromatic mol. changes bitterness to sweetness. Polyhydroxyl compds. are sweet and poly-nitrated compds. are bitter, but exceptions are noted in complex mols. No general law is known to predict the taste of a compd. when the mol. structure is known. Taste is influenced by so many things that it is impossible to study it satisfactorily. LOTTIE M. MANROSS.

**Examination of saccharin tablets.** H. DROOP RICHMOND, SEPTIMUS ROYCE AND CHAS. ALFRED HILL. *Analyst* 43, 402-4(1918).—Of saccharin tablets (219 samples) the manuf. of which is controlled 48% conformed with the standard and the remainder were within 10%. Uncontrolled samples (168) showed strength far below the controlled article. The principle of the method of R. and H. (*C. A.* 12, 2215) for estn. of saccharin was used. The boiling with alkali is dispensed with as the soap in some tablets causes frothing.

H. A. LEPPER.

**Sugar-saving substitutes in ice cream.** J. H. FRANDSEN, J. W. ROVNER AND JNO. LUTHELY. *J. Dairy Sci.* 2, 32-40(1919).—Four formulas are given which save 30-50% of cane sugar by use of corn sirup, corn sugar, or invert sirup. All the cane sugar could not be satisfactorily replaced. Also in *Nebr. Agr. Sta., Bull.* 168, 7 pp. H. A. L.

**The manufacture of Neufchatel and cream cheese in the factory.** K. J. MATHE-SON AND F. R. CAMMACK. U. S. Dept. Agr., *Bull.* 669, 28 pp.(1918).—Milk containing 4% butter fat is required for making Neufchatel cheese, while a butter fat content of 6 to 8% is required for cream cheese. The details of the manuf. of each is given. The cheese should be kept at a temp. of 40° to 50° until consumed.

J. J. SKINNER.

**Buttermilk cheese.** A. W. RUDNICK. *J. Dairy Sci.* 2, 41-5(1919).—Cheese can be made from butter-milk commercially by use of a centrifugal machine to sep. the curd and whey. A good grade milk makes a cheese similar to cottage cheese and fit for human food. Acidity, temp. and time of holding were found to be the main factors influencing the completeness of extn. of the whey.

H. A. LEPPER.

**The use of an acid in the Roese Gottlieb method for fat in dried buttermilk.** J. H. ROOP. *Chem. Analyst* 26, 21(1918).—Transfer 1 g. sample to the Rhorig tube, add 1 cc. 1:1 H<sub>2</sub>SO<sub>4</sub> and 9 cc. H<sub>2</sub>O. Digest on the steam bath for 30 min. The casein becomes flocculent. Add 10 cc. EtOH, 25 cc. Et<sub>2</sub>O, 25 cc. petroleum ether and shake. The ether layers are readily sepd., and results are said to be extremely accurate. The use of acid instead of the usual NH<sub>4</sub>OH is advantageous, because the fat is thereby more easily dissolved from the casein particles, and the formation of persistent emulsions is avoided.

H. M. LANCASTER.

**Note on the graduation of Gerber butyrometers.** H. DROOP RICHMOND. *Analyst* 43, 405(1918).—A discussion of slight errors in the formula of Day and Grimes (*C. A.* 12, 1353).

H. A. LEPPER.

**An oxidation method for the determination of lignin-free crude fiber in cocoa.** TH. VON FELLEBERG. *Mitt. Lebensm. Hyg.* 9, 277-83(1918).—Oxidize lignin by heating with dil. HNO<sub>3</sub> to substances sol. in alkali. Free 1 g. cocoa or 2 g. chocolate from fat by ether and then boil with 15 cc. N HNO<sub>3</sub> for 10 min. Filter on gooch, wash with hot water, hot 1% NaOH, hot HNO<sub>3</sub>, dil. NH<sub>4</sub>OH, hot water, alc. and ether. Dry and weigh to get lignin-free crude fiber, plus sand. Ignite and weigh sand. The value found for 13 samples of beans was from 3.68 to 5.27% (av. 4.4%), and for the shells was from 9.59 to 22.04% (av. 18.3%).

H. E. WOODWARD.

**Course of instruction in the inspection and reception of meats for the army.** *Bull. sci. pharmacol.* 25, Pt. I, 101-5(1918).—See also Pommier, *Inspection of meats*, Lyons, 1911.

M. HEIDELBERGER.

**Examination of fish.** P. K. W. BØKMAN. *Tidsskrift Kemi.* 15, 64-7(1918).—The method of Sørensen for the detn. of amino N by formol titration is applied to the detn. of the changes in the fish flesh and thereby in the evaluation of the quality of the fish as food. It is recommended also for meats. Twelve-day old fish-store samples gave a formol titratable N of 2.43%. These samples did not give positive tests

for  $\text{NH}_3$ . The figures for samples of fish in which the  $\text{NH}_3$  test was positive but not for  $\text{H}_2\text{S}$  ranged from 2.56 to 2.96.

A. R. ROSE.

Analysis of fish extracts. F. DE LEMOS. *Tidskrift Kemi*. 15, 61-4(1918).—Analytical data.

A. R. ROSE.

Bacteriological examination of canned foods. A. W. BITTING AND K. C. BITTING. Nat. Canners' Assoc., *Bull.* 14, 47 pp.(1918).—The object of bacteriol. examn. is three-fold: (1) To see if those foods which appear normal are sterile; (2) to find out whether foods which appear defective are sterile and whether spoilage is due to under-processing or leaks; (3) to det. the character of the original material from the finished product. (1) is done in packing; (2) after evidence of spoilage; (3) mostly upon tomato products. Explanation of terms used in food preserving, an outline of the method of examg. canned foods and of detecting defective cans, as well as an explanation of springers, improperly filled cans, leaks, swells and flat sour are given. Organisms found in cases of spoilage and the cause for variations of the number present are discussed.

LOTTIE M. MANROSS.

Reports of storage holdings of certain food products. J. O. BELL AND T. C. FRANKLIN. U. S. Dept. Agr., *Bull.* 709, pp. 44(1918).—Monthly cold storage holdings of a number of food products are given.

J. J. SKINNER.

Wheat. ANON. Council of Science and Industry, Australia, *Bull.* 5; *Bull. Imp. Inst.* 16, 249-50(1918).—Wheat after being freed from foreign matter by screening is mixed with 1% its wt. of hot, freshly burnt  $\text{CaO}$  and quickly transferred to a brick or stone silo until required for use. It should then be freed from  $\text{CaO}$  by suction and sifting machinery. It was found that such treatment considerably reduced the bacteria on the outer layers of grains. The degree of deterioration of wheat is indicated by the  $\text{NH}_3$  content of the  $\text{H}_2\text{O}$  ext. Damaged samples yield 8-12 times as much  $\text{NH}_3$  as clean wheats on extn. with  $\text{H}_2\text{O}$ . Treatment with  $\text{CaO}$  is also good for partially rotted wheat and for mousey tainted wheats, but probably not for weevils.

R. L. SIBLEY.

The composition of natural and polished Italian rice. I. GIOVANNI ISSOGLIO. *Atti accad. sci. Torino* 53, 731-44(1918).—Seven varieties of rice were examined, two being native and the remainder polished. Polishing reduced the total ash (from 1.4% native to about 0.5% polished), the ash content which is sol. in  $\text{HCl}$  being the principal portion affected. Lecithin, detd. as  $\text{P}_2\text{O}_5$ , was reduced to a trace in polishing, this component being present in unpolished rice at about 0.1%. The water content remained practically const. after polishing. Cl likewise remained const.

W. MORSE.

The digestibility of bran. GEORG WIEGNER. *Mitt. Lebensm. Hyg.* 9, 289-99 (1918).—As the result of expts. of several investigators, W. concludes that man digests bran as well as ruminants and swine. The evidence seems to be in favor of a whole-grain bread of a moderate coarseness.

H. E. WOODWARD.

The drying of vegetable substances carried out at different temperatures. G. ANDRÉ. *Bull. soc. chim.* 23, 430-7(1918).—A series of expts. on leaves (lilac, syringa, and maple), was carried out with the following app. A porcelain dish containing the leaves is put into a glass tube which is thrust into a  $\text{Cu}$  tube embedded in a regulated oil bath. A tube in which dry air circulates and a long thermometer with its reservoir just above the dish, pass through the stopper of the glass tube. The difference in wt. of the dish before and after heating gives the quantity of water lost by the leaves. The loss of water which accompanies the drying of the leaves or shoots, even up to a temp. of  $120^\circ$ , takes place slowly in a current of dry air. The speed is the same in dry  $\text{H}_2$ . The loss of  $\text{CO}_2$  which takes place during drying is very small.

LOTTIE M. MANROSS.

**Nutritive value of leaves.** H. EDIN. *Kungl. Landbruks-Akad. Handlingar Tidskrift*. 57, 397-417(1918).—This is one of a series of articles (cf. C. A. 12, 838, 1404) which have appeared in this journal on the nutritive value of leaves of possible fodder value for the stock of the North European countries. They are probably of little practical value for the chemists and nutritionists of America. Scientists interested along these lines will find considerable data in Vol. 57 of this journal as to the compn. and digestion of leaves of several trees, grasses, mosses, sea greens, and straws. The straw is treated to render it more digestible and palatable. Some of the articles treat of materials from the point of view of availability as human food. There are also some data on barks.

A. R. ROSE.

The results of microbiological and chemical investigations on the question of sweet green feed. R. BUNRI AND P. LIECHTI. *Mitt. Lebensm. Hyg.* 9, 287-8(1918).—While the feeding of sweet green stuff does not change the food value of cow milk, the milk cannot be used for making certain kinds of cheese. The loss and change in compn. is no greater in sweet green feed than in dry feed.

H. E. WOODWARD.

The presence of acetylmethylcarbinol in saccharin sorghum silage. W. G. FRIEDMANN AND C. T. DOWELL. *J. Ind. Eng. Chem.* 11, 129-30(1919).—Saccharin sorghum silage was found to contain AcMeCHOH, a volatile reducing substance previously found in cider vinegar. Cf. C. A. 11, 1001.

H. A. LEPPER.

Experiments of the experimental dairy station at Hoorn with the "Notfutter" of Prof. v. Calcar. J. J. OTT DE VRIES. *Vereeniging tot exploitatie eener proefsuivel-boerderij te Hoorn; Jahresbericht* 1916, 86; *Biedermanns Zentr.* 47, 176-80(1918).—This feed was prepared from mussels (with shells), fish unfit for trade, blood, and a variety of vegetable wastes. Feeding and digestion expts. were carried out with swine. The conclusions drawn are: (1) Barley and whey contain too little CaO for normal bone production in rapidly growing fattening swine so that addition of CaO in any form is always beneficial. (2) Mixed feed prepared according to Prof. v. Calcar's direction because of its content of fish meal contains, even without mussel shells, sufficient CaO for direct nutrition. (3) The increase in the digestibility of crude fiber, due to CaO, cannot be of importance in consequence of the low content of this food constituent and because of the easy digestibility of the crude fiber of the pods of legumes. (4) The digestible org. constituents amount to 54% of the feed, the content of digestible protein to 12.4%. (5) Without the mussels the "Notfutter" shows considerable similarity in food value to peas.

ALBERT R. MERZ.

The extent to which potatoes are utilized when fed in various forms (raw and cooked potatoes, raw and cooked silage-potatoes and dried potatoes—flakes and chips) to swine and ruminants. W. DIETRICH, A. DEUTSCHLAND, N. MUHR, A. BAUMANN AND W. VOLTZ. *Landw. Jahrb.* 50, 455-518(1917); *Biedermanns Zentr.* 47, 169-76(1918).—The digestion coeffs. of the various nutrients of these foods are given for swine and sheep.

ALBERT R. MERZ.

SJOLLEMA, B.: *Nieuwe gezichtspunten in de voedingsleer*. 2nd Ed. Revized and enlarged. Tiel: A. van Loon. 87 pp. For review see *Chem. Weekblad* 15, 1644(1918).

**Food product from milk.** P. W. TURNER. U. S. 1,289,021, Dec. 24. Fresh milk is treated with an enzyme such as rennet or pepsin and allowed to stand until it has curdled and the ppt. has assumed a flocculent, slightly adherent consistency. The material is then quickly cooled to inhibit further curdling and the mass is gently agitated to effect sepn. of the whey which is poured off after allowing the ppt. to settle,

the whey is concd., mixed with the ppt. previously sepd. from it and the mixt. is kept at a low temp. to preserve it in suitable condition for use as a food.

**Artificial milk.** K. ERSLEV. Brit. 121,133, Nov. 28, 1918. In making artificial milk from vegetable substances such as soy beans, earth nuts, pine kernels, sesame seeds, leguminosae in general, coconuts, palm kernels, or almonds, especially such as contain sugar and lecithin, the material is first treated with a solvent to ext. fat and then extd. with alc. The alc. ext. is evapd. to dryness and treated to remove any bitter taste. The residue from the alc. extn. is treated with a weak alk. soln. to dissolve proteins, and the ext. thus obtained is mixed with the treated material from the alc. ext. The substance thus obtained may be used in the manuf. of margarine. It may also be emulsified with fat, especially the fat originally extd. to produce artificial milk. The residue, after extn. with alkali, may be used as a cattle food.

**Butter substitutes.** H. GORTON. Brit. 120,836, Feb. 28, 1918. Mfg. margarine by adding egg albumin to the usual oil and fats and  $H_2O$  and churning the mixt. in the usual manner, without the addition of an emulsifier other than the albumin, and at a temp. above the m. p. of the fats employed and below the coagulation point of the albumin.

#### 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**The color and decolorization of water.** A. MASSINK. *Water* 2, 42; *Chem. Weekblad* 15, 1388(1918).—To find why waters of the same color intensity are not always decolorized at the same rate, the influence of various salts was studied. It was found that the decolorizing action of  $Fe(OH)_3$  suspension decreases with increasing concn. of the  $HCO_3^-$  ion. This fact can be made use of for more accurate titration of bicarbonate in colored waters.

JULIAN F. SMITH.

**The importance of electrical conductivity in the analysis of potable waters.** I. M. KOLTHOFF. Utrecht. *Chem. Weekblad* 15, 1160–83(1918).—The purpose of this investigation was to study the mutual influence of various salts on their dissociation in aq. soln. The work of previous investigators in the field of analysis by cond. detns., particularly Kohlrausch and Holborn, is reviewed. The ions in a normal water can be quickly detd., titrating  $Cl^-$  with  $AgNO_3$ ,  $HCO_3^-$  with acid using methyl orange as indicator, and  $SO_4^{--}$  iodometrically by the  $BaCrO_4$  method. Hardness is also easy to det. by Blacher's method. If no abnormal constituents are present, the alkali content can be calcd. by subtracting the hardness from the sum of the anions. But these methods give no control over the total analysis. If the degree of dissociation ( $\lambda$ ) is known for each salt present, the total cond. can be calcd. The observed cond. should be used as a control. To make such a calcn. accurate, the influence of different salts on each other should be known. Studies of this influence were made in various mixts. With  $NaCl$  and  $CaCl_2$  or  $MgCl_2$  in 0.1 N soln. at 18°, the calcd. sum agreed very closely with the observed total cond. With  $NaCl$  and  $Na_2SO_4$  in varying proportions (concn. 0.1 N), the calcd. values were from 0.6 to 2.3% too high. With  $CaCl_2$  and  $CaSO_4$  in 0.1 N soln., the calcd. values were 2.5 to 3% too high, but agreed more closely in 0.01 N soln. For mixts. of salts having no common ion, there was observed the general rule that  $\lambda$  for each salt is equal to the value corresponding to the total concn. of electrolytes. Gypsum is an exception; its value of  $\lambda$  is that corresponding to the total concn. of  $Ca^{++}$  and  $Mg^{++}$ . This rule is important for calcg. the cond. of potable waters of known compn. Tables, and directions for their use in making the necessary calcns., are appended to the article.

JULIAN F. SMITH.



**Chlorine treatment of London, England water supply.** A. C. HOUSTON. *Ann. Report Metropolitan Water Board, Year ending Mch. 31, 1918*; *Mun. County Eng.* 56, 29-30(1919); *Eng. Contrg.* 50, 414-5.—The charge has varied; usually 0.5 p. p. m. available Cl causes no complaint of tastes. Extreme cold and short contact are troublesome factors. Dechlorination with  $\text{SO}_2$  has been helpful in reducing taste.

LANGDON PEARSE.

**Toronto's drifting sand filter.** G. G. NASMITH AND N. J. HOWARD. *Munic. J.* 45, 390-2(1918); *Eng. News-Rec.* 81, 817-8(1918); *Can. Engr.* 35, 359-64(1918).—Results are detailed. During the test 1.02 grains of  $\text{Al}_2(\text{SO}_4)_3$  were used, with turbidity of raw water running from 1 to 115 p. p. m. The total bacterial reduction averaged 93.9%. With raw water running between 50 and 500, 97% were removed. In water under 45° F. floc forms more slowly.

LANGDON PEARSE.

**Performance of the Ransome drifting sand filters at Toronto, Ontario.** JOSEPH RACK. Committee on Water Supplies, *Am. Pub. Health Assoc.* 1918; *Munic. County Eng.* 56, 15(1919).—Operating results are given for Toronto filters. Chloramine treatment at Ottawa has been successful reducing dose from 0.75 p. p. m. available Cl with bleach to 0.25 p. p. m. with 0.06 p. p. m. of  $\text{NH}_3$  when water is near freezing, and to 0.5 p. p. m. when water is near 75° F. Cost is now greater, owing to high cost of  $\text{NH}_3$ .

LANGDON PEARSE.

**Advantages and disadvantages of the storage of water.** M. C. WHIPPLE. School of Public Health, Boston, 1918. *Eng. Contrg.* 50, 468-9(1918).—See C. A. 12, 2639.

LANGDON PEARSE.

**Chicago introduces new chlorinator.** JOHN ERICSON. *Munic. County Eng.* 56, 6-8(1919); *Eng. News-Rec.* 81, 1126-7(1918).—See C. A. 13, 49.

L. P.

**Coagulants versus sand filters as aids to water purification in the field.** H. S. BRIGGS AND E. E. MARLE. *Royal Engineers Journal* 1918; *Eng. Contr.* 50, 399-400(1918).—The authors describe temporary field practice in the British Army in Flanders, on a plant of max. capacity 300,000 gal. per day. They recommend liberal chem. treatment ( $7\frac{1}{2}$  to 20 grains per gal.) and 8 to 12 hrs. sedimentation followed by Cl disinfection.

LANGDON PEARSE.

**Taking a chance with an unsafe water supply proves costly.** *Ohio Pub. Health J.* Nov., 1918; *Munic. County Eng.* 56, 15-16(1919).—A typhoid epidemic resulted from imperfect disinfection with low-strength bleaching powder found to contain 20% of guaranteed strength.

LANGDON PEARSE.

**Findings of international joint commission on pollution of boundary waters.** F. A. DALLYN. *Am. Soc. Mun. Impol.* 1918; *Eng. Contrg.* 50, 459(1918); *Can. Engr.* 35, 323-5.—Extracts from a report stating a standard for Detroit and Niagara rivers, and indicating treatment where the flow of the diluting stream is less than 4 cu. ft. per sec. per capita, or water contains more than 500 *B. coli* per 100 cc.

LANGDON PEARSE.

**Sewage treatment in Eastern Pa.** ANON. *Munic. J.* 45, 386-8(1918).—Sewage treated with lime (1 ton 56% CaO per mil. gal.) passes between Fe plates serving as electrodes for d. c. to final sedimentation.

LANGDON PEARSE.

**Operating sewage plants.** Texas State Bd. Health, *Bull.* 1918; *Munic. J.* 45, 327-8(1918); *Eng. Contrg.* 50, 548-9(1918).—Instructions are given for operating sewage plants.

LANGDON PEARSE.

**Four methods of sewage treatment studied at New Haven testing station.** C. E. A. WINSLOW AND F. W. MOHLMAN. *Eng. News-Record* 82, 32-6(1919); *Munic. J.* 45, 280-2, 297-9, 321-2(1918); *Munic. County Eng.* 55, 173-5.—Eleven-month test at a cost of \$18,000 led to the conclusion that for 1 of 4 sewage-treatment works Miles' acid

process is best available, under local conditions. The sewage of 160,000 people now grossly pollutes the harbor, rendering shell-fish unfit to use and bathing dangerous. Fine screening, Imhoff tanks and activated sludge treatment (all with subsequent Cl disinfection) and Miles' acid pptn. with  $\text{SO}_2$  were tried. The sewage at times was low in bacteria because of Cu salts from munition works. Screens (30-mesh) removed from 12 to 15% suspended matter; slotted plate screens ( $1\frac{1}{4} \times \frac{1}{8}$  in. openings) removed 3 to 8% suspended matter. Imhoff tank removed 43% suspended matter but sludge was extremely abnormal, dewatering badly. The activated sludge process was not satisfactory because of antiseptic industrial waste. The amt. of Cl required for disinfection with activated sludge was 3 p. p. m., with Imhoff tank 6 p. p. m., with screen 5 p. p. m., and with crude sewage 8 p. p. m. Miles' acid treatment removed 61% suspended matter, gave clear effluent with marked bacterial reduction, and resulted in freedom from odor. The recovery of grease is apparently possible, though not commercially demonstrated. Higher alkalinity in other sewages makes cost of process higher and less favorable for other 3 plants.

LANGDON PEARSE.

Sewage sedimentation advised for Cleveland, Ohio. H. P. EDDY. *Report to Chf. Engr. Dept., Pub. Service* 1918; *Eng. News-Rec.* 81, 806(1918).—Imhoff tanks with Cl disinfection are recommended for plants on the lake shore in preference to screens and disinfection, to insure greater efficiency in protecting bathing beaches. During storms, bathing must be stopped because of overflows. In southerly district, on the Cuyahoga River, tanks and sprinkling filters are required. With money available partial projects are recommended, providing coarse screens and grit chambers with Cl disinfection on the lake, and in addition Imhoff tanks on the river. LANGDON PEARSE.

Extra-cantonment zone sanitation. W. A. HARDENBERGH. *Munic. J.* 45, 421-5, 450-2(1918).—A description of the activities of the U. S. Public Health Service at Camp Bowie and vicinity in anti-malarial work. Privies were cleaned up in both urban and rural surroundings.

LANGDON PEARSE.

Fumigation with formaldehyde. Substitute for the permanganate-formalin method. D. W. HORN. *J. Ind. Eng. Chem.* 11, 126-9(1919).—The use of bleaching powder and formalin for fumigation is proposed. The method compares favorably with the permanganate-formalin and dichromate-formalin methods at  $\frac{1}{6}$  of the cost of the permanganate method and  $\frac{1}{8}$  that of the dichromate method. M. K. BIRBY.

Widening demand for blast furnace slag (WRIGHT) 9. Calcium hypochlorite (U. S. pat. 1,288,587) 18.

HOUGH, THEODORE AND SEDGWICK, WILLIAM T.: *The Human Mechanism. Its Physiology and Hygiene and the Sanitation of its Surroundings.* Revized Ed. Boston: Ginn & Co. 572 pp. \$2. For review see *J. Am. Med. Assoc.* 71, 847 (1918).

KEEFER, FRANK R.: *A Text-Book of Elementary Military Hygiene and Sanitation.* 2nd Ed. Philadelphia: W. B. Saunders Co. 340 pp. \$1.75 net. For review see *J. Am. Med. Assoc.* 71, 1163(1918).

MODI, RAI BAHADUR JAISING P.: *Elements of Hygiene and Public Health.* Introduction by E. J. O'Meara. Calcutta: Butterworth & Co. 337 pp. 4 rupees net. For review see *J. Am. Med. Assoc.* 71, 1605(1918).

PRYOR, JAMES CHAMBERS: *Naval Hygiene.* Philadelphia: P. Blakiston's Son & Co. 507 pp. \$3 net. For review see *J. Am. Med. Assoc.* 71, 1243(1918).

Softening water. G. H. URCKE. *Brit.* 120,293-4, Dec. 13, 1917. See U. S. 1,255,358-9 (*C. A.* 12, 966).

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

**Influence of the mechanical composition of the soil on the availability of nitrate of soda and dried blood.** J. G. LIPMAN AND A. W. BLAIR. New Jersey Agr. Exp. Sta., *Rpt. Dept. Soil Chem. and Bact.* 1917, 336-68.—A continuation of work begun in 1911 (cf. C. A. 11, 1873). In these cylinder expts. barley and buckwheat were grown, the fertilizers being added to the first crop. The yield of barley was higher with  $\text{NaNO}_3$  than with dried blood. For the barley crop the av. recovery of N from  $\text{NaNO}_3$  was 60.53% and from dried blood 30.98%. The highest recovery from  $\text{NaNO}_3$  was 69.8% and from dried blood 41.1%. For the 2nd crop, buckwheat, the dried-blood cylinders gave the higher yield.  $\text{NaNO}_3$  produced no increase over the check. In the combined recoveries  $\text{NaNO}_3$  stands first in all series, the av. being 62.29% for  $\text{NaNO}_3$  and 42.5% for dried blood. From the results secured over a period of years it is shown that  $\text{NaNO}_3$  has little or no residual effect. Dried blood shows some residual effect. The initial effect of  $\text{NaNO}_3$  on these soils is more valuable than the total effect of dried blood.

J. J. SKINNER.

**The question of lime fertilizing.** E. TRUNINGER. *Mitt. Lebensm. Hyg.* 9, 288-9 (1918).—The degree of fineness and the amt. of limestone used had very little influence on the growth of oats. With red clover and carrots the finest limestone (0.1 mm. diam.) had a deleterious effect, while the larger sizes of limestone (2.0 mm. diam.) had a beneficial effect. This was very marked with the carrots.

H. E. WOODWARD.

**Ammoniacal liquor as a fertilizer.** F. MACH. *J. Ind. Eng. Chem.* 11, 156(1919).—A note on the results of work at the Agr. Institute, Baden. While good results are obtained with this by-product, it should be applied and ploughed under about 2 weeks before seeding the soil to avoid toxic effects of phenols,  $\text{H}_2\text{S}$ , HSCN, and HCN, which accompany the  $\text{NH}_3$ .

R. B. DEEMER.

**Valuation of fertilizers.** J. A. MURRAY. *J. Soc. Chem. Ind.* 37, 317-87(1918).—A criticism of the old "unit" system of price valuation of fertilizers which though simple fails to take into account the cost of production and value to the farmer. Formulas are given for more correct valuation and discussed in detail.

R. B. DEEMER.

**Fertilizer experiments with spoilt calcium cyanamide.** M. POPP. Oldenburg. *Mitt. deutsch. Landw. Ges.* 32, 776-80(1918); *Biedermanns Zentr.* 47, 299-307(1918); cf. C. A. 11, 1241.—The slight fertilizing action of old  $\text{CaCN}_2$ , obtained in previous expts. is attributed to chem. decompn. with the formation of dicyanodiamide. Samples of a lot of unbagged  $\text{CaCN}_2$  in storage were kept in cork-stoppered glass bottles. Analyses of these samples (a) taken in 1913, (b) in 1914, (c) in 1915 were made using Hager and Kern's method for the detn. of dicyanodiamide, with results as follows: Total N of the original samples: (a) 15.06, (b) 14.32, (c) 12.47%. In 1917 total N, cyanamide N and dicyanodiamide N, resp.: (a) 13.69, 2.45, 7.04; (b) 12.81, 1.21, 5.98; (c) 12.15, 1.19, 6.79%. The diminished % of total N is explained by the absorption of  $\text{H}_2\text{O}$ .  $\text{H}_2\text{O}$  also dissolved  $\text{CaCN}_2$ , which was decomposed into dicyanodiamide and urea. The results of pot expts. comparing  $\text{CaCN}_2$ ,  $\text{NH}_4\text{Cl}$ , urea and urea nitrate are reported. Both fresh and old  $\text{CaCN}_2$  were used and the effect of the addition of bog iron ore and Mn slag was investigated. The oat crop used 59-68% of the N in fresh  $\text{CaCN}_2$  and only 26% of that in old  $\text{CaCN}_2$ . Neither bog iron ore nor manganese slag showed any noteworthy effect. Old  $\text{CaCN}_2$  containing much dicyanodiamide caused a high N content in the straw. The expts. show that a  $\text{CaCN}_2$  with about 6.5% dicyanodiamide caused injury to the plants cultivated when used in quantities of 90 kg. per hectare.

ALBERT R. MERZ.

**Effects of certain alkali salts on ammonification.** P. E. BROWN AND D. R. JOHNSON. Iowa Agr. Expt. Sta., *Research Bull.* 44(1918).—A study was made of the effect of the alkali salts,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaHCO}_3$ ,  $\text{Na}_2\text{SO}_4$ , and  $\text{NaCl}$ , on ammonification in the presence and in the absence of  $\text{CaCO}_3$ . When used alone  $\text{CaCO}_3$  was found to exert a marked beneficial influence on ammonification. The greatest effect occurred with 0.3%, but up to 5.0% no decrease occurred. The alkali salts tested were found to exert a stimulating effect when used alone at very low concns. Thus, with  $\text{Na}_2\text{CO}_3$  a stimulating effect was observed at a concn. of 0.1%; with  $\text{NaHCO}_3$  at 0.05%; with  $\text{Na}_2\text{SO}_4$  at 0.1%; and with  $\text{NaCl}$  at 0.005%. Increased additions of these salts, however, failed to stimulate the ammonifiers but on the contrary retarded their action. For the soil used the point of toxicity was between 0.1% and 0.2% for  $\text{Na}_2\text{CO}_3$ ; between 0.05% and 0.1% for  $\text{NaHCO}_3$ ; between 0.1% and 0.5% for  $\text{Na}_2\text{SO}_4$ ; and between 0.005% and 0.01% for  $\text{NaCl}$ . Increasing additions of all these salts brought about gradually increasing depressions in ammonification. When  $\text{CaCO}_3$  was used with these salts it was found to reduce their toxicity to a considerable extent in every case, and in some instances made the toxic amts. of the salts actually stimulative to ammonification. Various combinations of the alkali salts were observed to exhibit a greater toxic effect than the same salts in the same concn. exhibited individually. The results obtained in greenhouse expts. confirmed the conclusions arrived at from lab. tests.

W. H. ROSS.

**Vegetative experiments on the availability of phosphorus and potassium compounds.** J. G. LIPMAN AND A. W. BLAIR. New Jersey Agr. Exp. Sta., *Rpt. Soil Chem. and Bact.* 1917, 353-68.—In these expts. testing several sources of phosphate, soybeans were grown in sand in earthenware pots. Basic slag and acid phosphate had about the same crop-producing power. Blue rock phosphate had practically no effect, and brown rock gave only a slight increase. The av. N content of the crop grown with basic slag was about equal to that with acid phosphate; it was less with raw rock phosphate. Greensand marl used as a source of K gave increased yields in a coarse, white sand. In a coarse sand containing 1.09% total  $\text{K}_2\text{O}$  applications of marl did not increase the growth of oats and buckwheat; it increases slightly the growth of barley. The % of  $\text{K}_2\text{O}$  in dry matter of soy beans from pots treated with sol.  $\text{K}_2\text{O}$  was higher than in that from marl-treated pots or the check pots, the yield of dry matter was not increased. The N content of the soy beans from the different pots was not widely different. "Soy beans when inoculated and supplied with lime and sol. phosphates can make a good growth and accumulate a high % of N up to the time the pods are half filled without the aid of readily sol. K compds."

J. J. SKINNER.

**Experiments on the value of greensand as a source of potassium for plant culture.** RODNEY H. TRUE AND FRED. W. GEISE. Dept. Agr. *J. Agr. Research* 15, 483-92 (1918).—It has been shown by pot expts. carried out with crushed quartz and Shive's three-salt nutrient soln. (C. A. 9, 2396) as a basis that greensands and greensand marls from Virginia and New Jersey are able to supply sufficient K to satisfy the demand of Turkey Red wheat and red clover during the first 2 months of their growth. This enables them to make a greater dry weight of tops than was seen in similar cultures in which the K demand was supplied by  $\text{KCl}$ ,  $\text{K}_2\text{SO}_4$ , and  $\text{K}_3\text{PO}_4$ . The results are thus thought to indicate that by the use of greensand sufficient K is rendered promptly available to meet the needs of many, perhaps most, farm crops. An exception was noted in the case of a greensand from Courtland, Va., which seemed to have a toxic effect on plants. Marls of this class, however, are very seldom encountered.

W. H. ROSS.

**Effects of farm manure in stimulating the yields of irrigated field crops.** C. S. SCOFIELD. Bur. Plant Ind. *J. Agr. Research* 15, 493-503(1918).—The effect of

manure on the yields of Irish potatoes and sugar beets under irrigation has been tested for 6 years in 7 rotations at each of 3 different stations in the northern Great Plains. Comparison was made between the yields of these crops when grown in rotations without manure and when grown in the same sequence in other rotations in which manure was applied at the rate of 12 tons per acre once during the cycle of the rotation. The results show that the effect of the manure at the 3 stations has been to increase the yield of potatoes about 40, 34 and 26 bushels per acre, resp.; to increase the proportion of marketable potatoes about 8, 7 and less than 1%, resp.; and to increase the yield of sugar beets 4.3, 1.9 and 2.6 tons per acre without materially affecting the sugar content of the beets. In 5 of the 7 rotations considered the increased yields were from the crop immediately following the application of the manure. In the other 2 rotations the yields were from crops produced the second season after the manure was applied. The increases in yield shown in these 2 cases, as well as the effects observed with other crops grown in these rotations, show that the benefit of the manure is appreciable for 2 years or more after it is applied.

W. H. Ross.

**Relation of inorganic soil colloids to plowsole in citrus groves in southern California.** CHARLES A. JENSEN. *Bur. Plant Ind. J. Agr. Research* 15, 505-19(1918).—A hard soil layer termed "plowsole" usually forms immediately under the soil mulch in cultivated citrus groves in southern California. After being broken up with a subsoiler it reforms when cultivation is resumed. It does not form in mulched basins, nor seriously in groves surface-mulched with organic matter and seldom cultivated. An examn. of soil samples collected from (1) the soil mulch, (2) the plowsole crust, and (3) the subsoil under the plowsole in each of 8 orange groves in which plowsole occurred showed that no accumulation of water-sol. Fe, Ca, Mg or  $\text{SiO}_2$  in the plowsole layer could account for its formation; that no greater accumulation of total  $\text{NH}_3$ -sol.  $\text{SiO}_2$ , Fe, Al or  $\text{P}_2\text{O}_5$  was found in the plowsole than in the soil mulch or in the subsoil; and that there was an accumulation of  $\text{NH}_3$ -sol. colloidal  $\text{SiO}_2$ , Fe and Al in the plowsole but not of colloidal  $\text{P}_2\text{O}_5$ . A study was accordingly undertaken of the inorganic material of a soil remaining in suspension in water, "colloidal suspension," at the end of 24 hrs. after the soil had been treated in a specified way. It was found that the plowsole contained a markedly higher percentage of inorganic colloid suspension than the soil mulch and usually higher than the subsoil. The addition of ground lime, S, and gypsum decreased, and  $\text{NaNO}_3$  increased the percentage of inorganic colloid suspension in the soil. Organic matter had the effect of counteracting the action of the lime and the  $\text{NaNO}_3$ , but not of the S or the gypsum. The compn. of the colloid suspension obtained from the soil was not affected by the addition of lime, S,  $\text{NaNO}_3$ ,  $\text{FeSO}_4$ ,  $(\text{NH}_4)_2\text{SO}_4$  or organic matter. The addition of gypsum, however, increased the percentage of  $\text{SiO}_2$ , Ca, Mg and decreased the percentage of Fe in the colloid suspension. The suspension was also found to contain a higher percentage of Fe, Al and Mn than the untreated soil, and the percentage of Fe and Al in colloid suspension from soils which readily form hard plowsole is higher than in the suspension from soils in which this is not formed. It is considered, therefore, that the percentage of Fe and Al in the colloid suspension from a soil is directly correlated with the readiness with which it forms plowsole.

W. H. Ross.

**The potash and lime requirements of legumes.** CLAUSEN. Heide (Holst.). *Illust. Landw. Ztg.* 37, 547-9(1917); *Biedermanns Zentr.* 47, 313-8(1918); cf. *Illust. Landw. Ztg.* 33, 910-1(1913).—Expts. were carried out with peas on a loamy sand soil and a pure sand soil both with and without the addition of marl. N fertilization paid only upon the unlimed loamy sand soil. Thomas slag meal was more effective on the limed soils.  $\text{K}_2\text{O}$  (as kainite) was advantageous wherever used. The addition of 5000 kg. marl per hectare gave increased yields (with one exception). This was especially

true upon the loamy soil because of the loosening and aerating effect of the added marl.

ALBERT R. MERZ.

Fertilization experiments with tobacco in 1915 and 1916. E. SIDENIUS. *Proefstation voor Vorstenlandsche Tabak Mededeeling* 26, 1916; Semarang (Java); *Biedermanns Zentr.* 47, 318-20(1918).—A continuation of expts. conducted in 1913-5 by deVries (*Biedermanns Zentr.* 1915, 533).  $(\text{NH}_4)_2\text{SO}_4$  gave not only increased yields but caused an improvement in quality of the tobacco and increase in length of the leaves. There is also a slight decrease in combustibility which was, however, of no practical importance. Stable manure caused inferior combustibility. This is ascribable to the Cl content of the manure.

ALBERT R. MERZ.

The corrosion of beet seeds with sulfuric acid. O. FALLADA. *Oesterr.-ung. Z. Zuckerind.* 1917, 22; *Biedermanns Zentr.* 47, 324-5(1918).— $\text{H}_2\text{SO}_4$  of 60° Bé. cannot replace concd.  $\text{H}_2\text{SO}_4$  in the Hiltner process for the corrosion of beet seeds to promote the rapidity of their germination. A 53° acid gave satisfactory results when the corrosion was conducted according to H. Mucha's modification in which the drum used is preheated with steam and the duration of action of the acid is extended to 2 1/2 hrs.

ALBERT R. MERZ.

The effect of certain organic substances on seed germination. E. B. FRED. *Soil Science* 6, 333-49(1918).—By means of pot expts. using Miami silt loam it was found that nitrogenous substances such as alfalfa powder, casein, and peptone do not seriously injure seed germination unless used in very large quantities. There was a decided decrease in germination of cottonseed when these substances were used in amts. greater than 0.5%.  $\text{CaCO}_3$  does not lessen the decrease in germination due to very large applications of alfalfa powder or casein. Sugar greatly increases bacterial growth and retards the rate of seed germination. The % of germination was decreased in amts. larger than 1%. In the presence of 5% of sugar all the seedlings were killed. The retarding action of sugar is probably due to the large amts. of  $\text{CO}_2$  given off in the decomposition of the sugar. Soil sterilization was found to inhibit the rate of seed germination.

J. J. SKINNER.

The effect of a humus-containing brown coal as a preservative of liquid manure. O. LEMMERMANN AND H. WEISSMANN. Berlin. *Mitt. deutsch. Landw. Ges.* 32, 741-3 (1917); *Biedermanns Zentr.* 47, 307-11(1918).—Lignite from near Sommerfeld was able to bind 5.12%  $\text{NH}_3$  while a peat could only fix 1.98%. Expts. showed that the coal added in quantities of 50 to 60% could preserve even strongly fermented liquid manures. Fertilizer expts. with the liquid thus treated showed an excellent effect which exceeded the effect of  $(\text{NH}_4)_2\text{SO}_4$  added in corresponding amts. The large amt. of brown coal necessary is a drawback to its use for this purpose.

ALBERT R. MERZ.

Manuring of *Hevea brasiliensis*. R. D. ANSTRAD. *Agr. J. India* 13, 661-5 (1918).—Some of the most successful results in South India in manuring rubber trees have been obtained from the use of lime and manure. Expts. are cited in which lime produced 2.15 lbs. of made rubber per tree, lime and manure 2.44 lbs., against 2.34 lbs. for the untreated tree. In another expt. lime gave a production of 2.37 lbs. per tree and  $\text{NaNO}_3$  only 2.05 lbs. The most successful rubber production was secured where lime was used in amts. of 1000 lbs. per acre and a green manure crop turned under annually. An expt. conducted in Ceylon is cited where P fertilizers gave best results and K the poorest. N produced a large increase after the first application, but a decrease in the following years when the same application was repeated. The cause of the failure of fertilizer expts. with rubber trees in general is discussed.

J. J. SKINNER.

Report Rothamstead experiment station 1915-17. E. J. RUSSELL. 71 pp. A rept. of the work which gives a summary of papers published in scientific journals.

A guide to the expt. plots is given, with tables appended giving the yields in 1915-'16-'17 of the various fertilizer plots conducted at the station. J. J. SKINNER.

Potash salts in the United States (ANON.) 18. Widening demand for blast-furnace slag (WRIGHT) 9. Lead arsenate (Brit. pat. 121,101) 18.

WERY, GEORGES: *Les établissements scientifiques de recherches agricoles en France et à l'étranger.* Paris: Société l'encouragement pour l'industrie nationale. 164 pp. For review see *Rev. sci.* 56, 753(1918).

Fertilizers; insecticides. G. TRUFFAUT. Brit. 120,288, Dec. 3, 1917. A compn. for application to soil to act as a fertilizer and insecticide consists of CaS, heavy tar oils or hydrocarbons which have been treated with alk. solns. to remove phenols, cresols, etc., and with acids such as  $H_2SO_4$ , to remove bases, crude  $CaSO_4$ , and  $Ca_3(PO_4)_2$ .

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

Review of the American patent literature on arsphenamine (salvarsan) and other arsenicals. H. L. LEWIS. *J. Ind. Eng. Chem.* 11, 141-5(1918). W. O. E.

Effect of heating opium on its morphine content. H. E. ANNETT AND H. SINGH. *J. Soc. Chem. Ind.* 37, 315-7T(1918).—Samples of opium heated in a  $H_2O$  oven at  $97-8^\circ$  may suffer a large decrease in morphine content. No such loss, however, was observable during the first 5 days' heating, and hence this treatment can hardly affect results obtained by the B. P. method. Opium, when heated in the  $H_2O$  oven, suffers a marked change in its physical properties. W. O. E.

Lead in pharmaceutical zinc oxide. W. D. COLLINS AND W. F. CLARKE. *J. Ind. Eng. Chem.* 11, 138-9(1918).—"For a short time after the beginning of the war it was not possible to procure ZnO of the U. S. P. standard produced in the U. S. The U. S. P. test for heavy metals will not detect less than 0.05% of Pb in ZnO. It is possible at the present time to obtain ZnO which, with respect to the presence of Pb, is of much higher quality than is called for by the requirements of the U. S. P." W. O. E.

Estimation of phenacetin and other *p*-aminophenol derivatives by hypochlorous acid. A. D. POWELL. *Analyst* 44, 22-5(1919).—The method is based on the reaction obtaining between a hypochlorite (Cl) and a salt of *p*-aminophenol, as:  $HOC_6H_4NH_2 \cdot HCl + 4Cl = O:C_6H_4NCl + 4HCl$ , the soln. containing the quinone chlorimine being thereupon freed from Cl, KI added, and the 4 atoms of I liberated by a reverse of the reaction just given then titrated with 0.1 *N*  $Na_2S_2O_3$ . In the case of metol (methyl-*p*-aminophenol sulfate), it should be noted that, owing to the presence of the Me in the  $NH_2$  group, no chlorination of the latter takes place, although a quinone deriv. is formed, as:  $HOC_6H_4NHCH_3 + 2Cl = O:C_6H_4NCH_3 + 2HCl$ . Since it was found best to remove free Cl (due to excess of hypochlorite) by blowing a stream of air through the soln., a correction was necessary on account of the slight volatility of chlorimine and also for the action of dissolved air on the iodide, such correction averaging 1.5% of the total quinone chlorimine present for an aeration of 15-20 min. *Estimation of p-aminophenol, p-phenetidine, etc.*: An amt. of an acid soln. equiv. to about 0.1 g. of the base is measured into a 250-cc. stoppered bottle and diluted to rather more than 100 cc., 5 cc. strong HCl are added, followed by 10 cc. of NaOCl soln. (about

0.8 N). The resulting soln. should be pure yellow and not deposit yellow flocks. Air is now blown through at a brisk rate for 15 min., 2.5 g. of KI are added, and the soln. is allowed to stand for at least 15 min. The liberated I is then titrated with 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  (1 cc. = 0.00273 g. *p*-aminophenol or 0.00343 g. *p*-phenetidine) and starch indicator. The result is multiplied by the factor 1.015 to correct for loss during aeration. *Estimation of phenacetin.*: One g. of phenacetin is boiled for 2 hrs. with a mixt. of 25 cc. strong HCl (1.16) and 15 cc. of  $\text{H}_2\text{O}$  in a small flask fitted with an air condenser. After cooling, the soln. is diluted to some definite vol., and an aliquot representing 0.2 g. phenacetin taken for the estn. exactly as above. One cc. 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  = 0.00448 = phenacetin. In the presence of caffeine citrate, the results obtained were slightly high. In admixt. with salol, hydrolysis was first effected with 10% NaOH soln. followed by treatment with boiling strong HCl. After removal of salicylic acid and phenol with  $\text{Et}_2\text{O}$ , the chlorination and titration were carried out in the usual manner. Mixtures of phenacetin and acetanilide cannot be analyzed without first removing the latter. Estn. of other *p*-aminophenol derivs. as lactophenin and salophen were effected in exactly the same way as phenacetin. The basic reaction above indicated for true metol (methyl-*p*-aminophenol sulfate) involving the liberation of only 2 atoms of I provides a simple means of distinguishing between that product and its "substitutes," since all of the latter examd. were found to be either *p*-aminophenol or *p*-aminocresol salts.

W. O. E.

*Preparation of sodium salicylate and sodium theobrominate.* G. DALL'ACQUA. *Boll. chim. farm.* 57, 201-2 (1918).—For each kg. of diuretin there are required 442 g. of Na salicylate and this may be prepd. by the reaction of 381.20 g. salicylic acid and 232 g.  $\text{NaHCO}_3$ . For the prepn. of the corresponding amt. of Na theobrominate 110.5 g. NaOH free from carbonate are dissolved in an equal wt. of boiled distd.  $\text{H}_2\text{O}$  and thoroughly mixed with 497.2 g. theobromine previously moistened with approx. 150 cc. abs. alc. or alc. distd. over NaOH. When the mass is almost entirely cooled it is intimately mixed with the Na salicylate after it has been ascertained that the latter does not yield  $\text{CO}_2$  when treated with dil. acid. The mixt. may be readily dried to a pulverulent mass containing about 10%  $\text{H}_2\text{O}$  and the latter may be removed by prolonged heating if desired. The yield is practically theoretical and the product complies with the required tests. A mixt. of  $\text{AcONa}$  and Na theobrominate may be prepd. in a similar manner.

H. S. PAINE.

*Chemical evaluation of digitalis.* A. TSCHIRCH AND F. WOLTER. *Univ. Bern. Schweiz. Apoth. Ztg.* 56, 469-74, 495-8, 512-4 (1918).—Present physiol. methods define only the poison, not the therapeutic value of digitalis, and this in the frog only. Chem. evaluation hitherto has not always represented the true active principles; thus, *e. g.*, digitoxin (pseudodigitoxin, Tschirch), usually resulting in chem. assay, is not a uniform substance, and gitalin, the carrier of the sp. digitalis effect (Focke, Tschirch), is not detd. at all in Keller's method. After comparing the methods of Keller, Reed and Vanderkleed, Stoeder, Burmann and Martindale as to their yield in glucosides and the physiol. activity of the latter, a new method is proposed, based on that of Keller. Ext. the leaves first with  $\text{Et}_2\text{O}$ , removing chlorophyll, fat and resins. Distil off the  $\text{Et}_2\text{O}$ , ext. the leaves with abs. EtOH and purify as usual with  $\text{Pb}(\text{OAc})_2 \cdot \text{PbO}$ . A colorless liquid results. In now extg. the glucosides,  $\text{CHCl}_3$  is replaced by acetone, which is found to be the best solvent for the active principles of digitalis. It dissolves gitalin, digitoxin and digitalin Boehringer; digitalin Merck and digitonin are insol. By adding NaCl to the aq. acetone soln. the inert aq. layer is sepd. The evapn. residue of the acetone contains all the active principles of digitalis, called *pandigilon*. Its physiol. activity was found to be 1.2 mg. per g. of frog wt., while direct extn. of the leaves gave a much more active residue, 0.47 mg. The discrepancy is unaccounted for;



the intermediate fluids and ppts. are inert. This and some special expts. support Ziegenbein's observation that pseudodigitoxin isolated from a given wt. of dried leaves, was from 2.6 to 6.6 times less active than the leaves themselves. T. contends that the active principles of digitalis are held in soln. by the aid of other substances, which enhances their activity by mutual influence. While the new method yields practically all active digitalis principles, and in a purer state than obtained by other methods, no relation has been found to exist between the chem. and physiol. values of digitalis leaves. S. WALDBOTT.

**Sulfopinol, a substitute for unguentum sulfuratum compositum.** ANON. *Svensk Farm. Tid.* 1918, 361; *Schweiz. Apoth. Ztg.* 56, 517(1918).—Take of liquid pitch 150 g., pure KOH, 16; wheat starch, 75; sublimed S, 150; H<sub>2</sub>O to make 1000 g. Boil the wood tar with KOH and a little H<sub>2</sub>O until completely saponified; dissolve the tar soap in warm H<sub>2</sub>O. Add the starch previously triturated with cold H<sub>2</sub>O, heat again until a paste is obtained. Allow to cool and add the S. Sulfopinol has the consistency of a viscous liniment, and has been applied with success in a Stockholm hospital. S. W.

**Table of national pharmacopeias.** C. BUHRER. *Schweiz. Apoth. Ztg.* 56, 515-7 (1918).—A list of the various editions, with dates, of the pharmacopeias official in different countries. Taken from Bruntz et Jaloux, *Les plantes officinales*. S. W.

**Permanent and resorbable corrosive sublimate pills.** ANON. *Union pharm.* 1917, 6; *Schweiz. Apoth. Ztg.* 56, 484-5(1918).—Take of HgCl<sub>2</sub> 1 g., powdered opium 1 g., licorice powder 5, mass of gum 3.2 g. Divide into 100 pills. To obtain the mass of gum, allow 1 g. of powdered gum tragacanth and 1 g. of gum arabic to swell in 10 g. of warm glycerol. The powders are then incorporated in this excipient. In this form, the HgCl<sub>2</sub> is partly dissolved in glycerol, and intimately mixed with colloidal substances which swell gradually in contact with the digestive juices. Thus it is brought into soln. gradually, without irritating the stomach or the intestines. Besides, in this combination it does not undergo any harmful chem. change. S. WALDBOTT.

**Action of Dakin's solution on catgut and silk.** D. CHEVRIER. *Bull. soc. pharm. Bordeaux; Schweiz. Apoth. Ztg.* 56, 474(1918).—Dakin's soln. containing 0.5% hypochlorite, after 3 hrs. contact, causes catgut to swell, later to gelatinize and dissolve. Silk undergoes similar changes, hence the danger in applying Dakin's soln. in the method of Carrel to the first dressing following a surgical operation, owing to the powerful proteolytic properties of the soln. S. WALDBOTT.

**Retrogression of Dakin's solution when in contact with caoutchouc.** D. CHEVRIER. *Schweiz. Apoth. Ztg.* 56, 498(1918).—Rubber tubing in contact with Dakin's soln. caused, after 12 hrs., an 8.5 and 8.7% reduction in the titer of Cl in 2 cases, and of 33.3% in the case where old tubing was used. S. WALDBOTT.

**Official standard for caffeine sodio-benzoate.** A. B. LYONS. *J. Am. Pharm. Assoc.* 7, 1029-30(1918).—The U. S. Pharmacopeia permits a variation of from 46 to 50% in the caffeine content of this salt. The discussion indicates that a range of from 47.3 to 48% of anhydrous caffeine is amply sufficient. L. E. WARREN.

**The effect of alcohol on pituitary extract.** H. C. HAMILTON. *J. Am. Pharm. Assoc.* 7, 1030-1(1918).—Pituitary preps. containing more EtOH than could possibly be present from washing the syringe or the site of injections with EtOH, were diluted and tested by the usual method. The activity was unlessered. From a series of expts. H. concludes that the only action between EtOH and pituitary exts. is a precipitant one if the solvent be in very great excess. L. E. WARREN.

BRUNTZ, L. AND JALOUX, M.: *Plantes officinales et plantes a drogues medicamenteuses, Nomenclature methodique dressé d'après toutes les editions, des codes officiels des médicaments des divers etats du monde.* Paris: Vigot frères. 326 pp. 15 francs. For review see *Rev. sci.* 56, 443(1918).

REMINGTON, J. P., *et al.*: *The Dispensatory of the United States of America.* Revized and rewritten and based on the 9th revision of the U. S. Pharmacopeia and the British Pharmacopeia, 1914. 20th Ed. Philadelphia: J. B. Lippincott Co. 2150 pp. 112. For review see *J. Am. Med. Assoc.* 71, 1338(1918).

LEFTWICH, RALPH WINNINGTON: *Aids to Rational Therapeutics with U. S. A. Pharmacopeia Equivalents.* New York: William Wood & Co. 233 pp. \$1.50. For review see *J. Am. Med. Assoc.* 71, 1433(1918).

VELDE, J. H. VAN DE AND VELDE, A. H. VAN DE: *Boekhouden voor apothekers; tevens beginselen van het boekhouden voor iedereen.* Amsterdam: D. B. Canten. 72 pp. 1.80 f. For review see *Chem. Weekblad* 15, 1611(1918).

**Dry tuberculin preparation.** E. HELBIG. U. S. 1,288,582, Dec. 24. A dry tuberculin prepn. suitable for making injection liquids is prepd. by mixing concd. tuberculin with about an equal weight of dehydrated borax. Glycerol, NaCl and milk sugar may be included in the mixt. and it may be formed into tablets.

**Synthetic drugs.** ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH. Brit. 120,383, Oct. 3, 1918. Aromatic arsonic acids, containing an  $\alpha$ -aminoacylarylamide group  $\text{—NH.CHR.CONR'R''}$  ( $R = H$ , alkyl, or aryl,  $R'$  and  $R'' = H$  or aryl), are prepd., (1) by treating  $p$ -aminophenylarsonic acid, or homologs, isomers, or substitution products thereof, or their salts, with an  $\alpha$ -haloacylarylamide, (2) by treating an ester of a phenylglycinearsonic acid with an arylamine. Examples are given of the prepn. of phenylglycinanilide- $p$ -arsonic acid from  $p$ -aminoglycinanilide- $p$ -arsonic acid from  $p$ -aminophenylarsonic acid and  $\alpha$ -iodoacetanilide (or the corresponding bromo- or chloroacetanilide) and from the methyl ether of phenylglycine- $p$ -arsonic acid and aniline and of phenylglycyl- $m'$ -aminophenol- $p$ -arsonic acid from  $p$ -aminophenylarsonic acid and  $m$ -chloroacetylaminophenol. The following products also are specified: phenylglycine- $p$ -arsonic acid- $o'$ -toluidide,  $-m'$ -toluidide,  $-p$ -toluidide,  $\alpha$ -naphthalide,  $-\beta$ -naphthalide- $p'$ -chloroanilide,  $-p'$ -iodoanilide,  $-p'$ -nitroanilide,  $-p'$ -aminoanilide,  $-p'$ -acetaminoanilide,  $-p'$ -uraminoanilide,  $-4'$ -methyl-5'-uraminoanilide,  $-m'$ -oxamylaminoanilide,  $-p'$ -oxamylaminoanilide,  $-p'$ -hydroxyanilide,  $-4'$ -hydroxy- $\alpha$ -naphthalide,  $-p'$ -methoxyanilide,  $p$ -arsonic acid of phenylglycyl- $o'$ -aminophenoxyacetamide,  $-p'$ -aminophenoxyacetic acid,  $-p'$ -aminophenoxyacetamide,  $-p'$ -aminophenoxyacetylurea,  $-3'$ -methyl-4'-aminophenoxyacetic acid,  $-\text{anthranilic acid}$ ,  $-\text{anthranilic ethyl ester}$ ,  $-N$ -methylantranilic acid,  $-\text{anthranilamide}$ ,  $-m'$ -aminobenzamide,  $-m'$ -aminobenzoylurea,  $-p'$ -aminobenzamide,  $-5$ -aminosalicylamide,  $-m'$ -aminobenzenesulfoneamide,  $-\text{sulfanilic acid}$ ,  $-p'$ -aminobenzenesulfonamide,  $-p'$ -aminophenylarsonic acid,  $-m'$ -aminophenylacetamide,  $-p'$ -aminophenylacetamide,  $-p'$ -aminophenylacetylurea,  $-p'$ -aminoacetophenone, 4-arsonic acid of 2-methylphenylglycyl-3'-aminophenol, 4-arsonic acid of 2-methylphenylglycyl-4'-aminophenol,  $p$ -arsonic acids of phenyl- $\alpha$ -phenylglycyl- $m'$ -aminophenol,  $-p'$ -aminophenylurea,  $-m'$ -aminobenzamide,  $-p'$ -aminophenylacetamide. Sol. salts are prepd. by treating the products with NaOH, etc.

**Synthetic drugs.** ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH. Brit. 120,384, Oct. 3, 1918. Aromatic arsenoxides containing an  $\alpha$ -aminoacylamide group  $\text{—NH.CHR.CONR'R''}$  ( $R, R'$ , and  $R'' = H$ , alkyl, or aryl), are prepd. (1) by treating the arsonic acids described in 120,381 and 120,383 with mild reducing agents, *e. g.*,  $\text{SO}_2$  in the presence of HI, (2) by treating aminophenylarsenoxides with  $\alpha$ -haloacyl-

amides. Examples are given of the prepn. of phenyl-*p*-arsenoxide- $\alpha$ -phenylglycinamide by reducing the corresponding arsonic acid, phenyl-*p*-arsenoxideglycinanilide by condensing *p*-aminophenylarsenoxide with  $\alpha$ -chloroacetylaniine, phenyl-*p*-arsenoxideglycyl-*m'*-aminophenol and phenyl-*p*-arsenoxideglycylanthranilic acid by reduction of the corresponding arsonic acids. The following products are also specified: *p*-arsenoxides of phenylglycyl-*p'*-aminophenol, -*m'*-aminobenzenesulfonamide, -*p'*-aminobenzenesulfonamide, -sulfanilic acid, and of *o*-tolylglycyl-4'-aminophenol.

**Synthetic drugs.** ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH. Brit. 120,385, Oct. 3, 1917. Arsenoaryl compds. containing in each aromatic nucleus an  $\alpha$ -aminoacylarylamide group are prepd. by treating with strong reducing agents the corresponding arsonic acids or arsenoxides, described in 120,383 and 120,384 (*supra*). Examples are given of the prepn. of *p*-arsenophenylglycinebis-*m'*-hydroxyanilide by reducing the *p*-arsonic acid of phenylglycyl-*m'*-aminophenol with hypophosphorus acid in the presence of HI, or by reducing the corresponding arsenoxide with hypophosphorus acid alone. The following products also are specified: *p*-arsenophenylglycinebis-*p'*-hydroxyanilide, 4-arsenophenylglycinebis-3'-carboxamido-4'-hydroxyanilide, *p*-arsenophenylglycinebis-*m'*-sulfonamidoanilide, *p*-arsenophenylglycinebis-*p'*-hydroxyanilide. The products containing salt-forming groups (OH, HOCO, SO<sub>3</sub>H, etc.) are sol. in aq. alkalis.

**Synthetic drugs; intermediate products.** N. NAGAI. Brit. 120,936, July 13, 1917. 1-Phenyl-2-nitro-1-propanol (*a*) is prepd. by condensing BzH with nitroethane in the presence of weak inorg. or org. bases. 1-Phenyl-2-(methylamino)-1-propanol is obtained by reducing (*a*) in the presence of HCHO by means of Zn and HOAc; the acetate formed is converted into the hydrochloride. The product is isomeric with the known ephedrine and resembles them in its pupil-dilating properties.

**Synthetic drugs.** ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH. Brit. 120,381, Oct. 3, 1918. Aromatic arsonic acids containing an  $\alpha$ -amino acylamide group NH.CHR.CONR'R' (R = H, alkyl, or aryl, R' = H, benzyl, or substituted benzyl) are prepd. (1) by treating *p*-aminophenylarsonic acid, or its isomers, homologs, or substitution products, or salts thereof, with an  $\alpha$ -haloacylamide; (2) by treating the esters of phenylglycinearsonic acids with NH<sub>3</sub> or an amine. Examples are given of the prepn. of phenylglycinamide-*p*-arsonic acid from *p*-aminophenylarsonic acid and chloroacetamide, or from methyl phenylglycine-*p*-arsonate and NH<sub>3</sub>, and of the  $\alpha$ -phenyl deriv. thereof from *p*-aminophenylarsonic acid and phenylchloroacetamide. The following products are also specified: phenylglycinamide-*o*- and -*m*-arsonic acids, phenylglycinemethylamide-*m*- and -*p*-arsonic acids, phenylglycinethylamide-*p*-arsonic acid, phenylglycinepropylamide-*p*-arsonic acid, phenylglycinedimethylamide-*p*-arsonic acid, phenylglycinediethylamide-*p*-arsonic acid, phenylglycinepiperidide-*p*-arsonic acid, phenylglycinebenzylamide-*p*-arsonic acid, phenylglycine-*m'*-carboxamidobenzylamide-*p*-arsonic acid, phenylglycine-*p'*-acetaminobenzylamide-*p*-arsonic acid, phenylglycine-*m'*-carboxureidobenzylamide-*p*-arsonic acid, phenylglycine-*p*-uraminobenzylamide-*p*-arsonic acid, phenyl- $\alpha$ -aminopropionamide-*p*-arsonic acid, and the glycinamides of amino-*o*-tolyl-*p*-arsonic acid and amino-*m*-tolyl-*p*-arsonic acid. Sol. salts are prepd. by treating the products with alkalis, alkali carbonates, or NH<sub>3</sub>.

**Synthetic drugs.** ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH. Brit. 120,382, Oct. 3, 1918. Aromatic arsonic acids, containing an  $\alpha$ -aminoacylurea group -NH.CHR.CONHCONHR' (R = H, alkyl, or aryl, R' = H, alkyl, aryl, or aralkyl) are prepd. by treating *p*-aminophenylarsonic acid, or its isomers, homologs, or substitution products, or salts thereof, with  $\alpha$ -halogenacylureas XCHRCONHCONHR' (X = halogen). Examples are given of the prepn. of phenylglycineureide-*p*-arsonic

acid from *p*-aminophenylarsonic acid and  $\alpha$ -chloroacetylurea, phenylglycine- $\beta$ -methylureide-*p*-arsonic acid from *p*-aminophenylarsonic acid and  $\alpha$ -chloroacetyl- $\beta$ -methylurea, and phenyl- $\alpha$ -phenylglycineureide-*p*-arsonic acid from *p*-aminophenylarsonic acid and  $\alpha$ -phenyl- $\alpha$ -chloroacetylurea. The following products also are specified: phenylglycinethylureide-*p*-arsonic acid, phenyl- $\alpha$ -aminopropylurea-*p*-arsonic acid, phenylglycinebenzylureide-*p*-arsonic acid, phenylglycinebenzylureide-*p*-arsonic acid, *o*-tolylglycineureide-*p*-arsonic acid, *o*-tolylglycinemethylureide-*p*-arsonic acid, phenylglycinemethylureide-*m*-arsonic acid, and 2-hydroxyphenylglycineureide-5-arsonic acid. Sol. salts are obtained by treating the products with NaOH, etc. Phenylglycylurethan-*p*-arsonic acid also is described.

**Compounds of urea and a calcium salt.** KNOLL & Co. Ger. 306,804, 1918. The compd.,  $\text{CaCl}_2 \cdot 4\text{CO}(\text{NH}_2)_2$ , white powder, stable in air and very readily sol. in  $\text{H}_2\text{O}$ , m.  $158-160^\circ$ , is obtained by evapg. an aq. soln. of the components in the required proportion to dryness or of an alc. soln. to crystn.; it is useful for subcutaneous injection in hay fever and asthma, since it does not give rise to pain as does  $\text{CaCl}_2$  alone. The compds. of  $\text{CaCl}_2$  with one, two, or three mols. of urea are hygroscopic, while those with more than four mols. have a too low content of  $\text{CaCl}_2$  for pharmaceutical purposes.

**Ethanoltrialkylarsonium hydroxides and their salts.** CHEM. WERKE GRENZACH. Ger. 305,772, 1918. Arsonium compds. of the choline type are prepd. by the action of glycol halohydrins on trialkylarsines; they possess valuable therapeutic properties. *Trimethylethanolarsonium hydrochloride*,  $\text{C}_6\text{H}_{14}\text{OAsCl}$ , very hygroscopic, prismatic crystals, m.  $218-220^\circ$ , is produced from  $\text{CH}_2\text{ClCH}_2\text{OH}$  and  $\text{Me}_3\text{As}$  at  $120-125^\circ$ ; the free base forms a viscous mass which slowly crystallizes and reacts strongly alk.  $\text{H}_2\text{S}$  does not give a ppt. with the aq. soln. of the hydrochloride; with  $\text{HgCl}_2$ , a cryst. double salt is formed. Mayer's reagent gives a faint white, KI and I a dirty brown ppt. Phosphotungstic acid gives a copious white ppt. The hydriodide forms long, hygroscopic needles; the sulfate, m.  $240^\circ$ , is hygroscopic. The diiodosalicylate, m.  $140^\circ$ , is stable in the air. The picrate, Au and Pt salts, and the picrolonate are also described. *Trimethylethanolarsonium hydrobromide* forms thick, hygroscopic prisms, m.  $219^\circ$ . *Triethylethanolarsonium hydrochloride*, consists of slender, very hygroscopic needles; the free base forms a viscous mass. The *di-iodosalicylate*, m.  $118^\circ$ , is stable in the air, as is also the *triborate*. The *picrate* m.  $152^\circ$ .

**Hydrogenated alkaloids.** C. F. BOEHRINGER & SÖHNE. Ger. 306,939, 1918. Alkaloids or their salts can be smoothly hydrogenated in aq. soln. or suspension by means of mol. H in the presence of Ni suboxide; the temp. may be normal or somewhat above (up to  $60^\circ$ ), and the pressure normal or slightly raised. Thus, hydroquinine and dihydromorphine are prepd. from quinine-HCl and morphine, resp., while cinchamylcoccaine gives hydrocinchamylcoccaine, an oily liquid which is decomposed by heat.

**Enzymes.** CHEM. WORKS (FORMERLY SANDOZ) AND A. STOLL. Brit. 120,571, Oct. 21, 1918. Peroxidases are extd. from plants rich in them (*Cochlearia armoracia*, *Cucurbita pepo*, *Brassica rapa*, etc.) by steeping thin slices in dil. acid, washing away sol. products in  $\text{H}_2\text{O}$ , then extg. the peroxidases by dil. alkali, and fractionally pptg. by alc. The products may be further purified by treating their aq. solns. with Hg salts to ppt. inactive substances. According to an example, horse-radish roots are sliced, dialyzed in running  $\text{H}_2\text{O}$ , steeped in dil. oxalic acid, washed, and extd. with  $\text{Ba}(\text{OH})_2$  soln.; the ext. is neutralized with dil. acid, and mixed with alc.; the ppt. is filtered off, the filtrate concd., and again mixed with alc.; the pptd. peroxidase is further purified by dissolving in  $\text{H}_2\text{O}$ , adding  $\text{HgCl}_2$  soln., filtering off the ppt., and pptg. the filtrate by excess of alc.; the product is finally freed from Hg by redissolving in  $\text{H}_2\text{O}$  and re-pptg. by alc. The products are suitable for intravenous injection, etc.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Our chemical industries made permanent. G. W. THOMPSON. *Chem. Met. Eng.* 20, 118-23(1919). E. H.

The French chemical industry. ANON. *Chem. Trade J.* 64, 41-2(1919). E. H.

The future of Madagascar. L. DE PRITZBUER. *Chim. & ind.* 1, 679-83(1918).  
—A review of the present, and of the probable future development of the natural resources of Madagascar. R. H. LOMBARD.

Nitric acid as a by-product of internal-combustion engines. A. W. H. GRIEPE. *Am. Gas Eng. J.* 109, 487-9, 492(1918).—The author outlines, with curves, illustrations, and calcs., the following proposed processes: "(1) An explosive mixt. of gas and air is compressed and ignited; the explosive mixt. decomposes into NO at 2250° and 40 atm. pressure. At this period H<sub>2</sub>O is injected to cool the gases quickly, thus forming NO<sub>2</sub> and HNO<sub>3</sub>. (2) In a 4-cycle gas engine, instead of letting the gases expand gradually, at the highest pressure and highest temp. (2250° and 41 atm.) H<sub>2</sub>O is injected, reducing the temp. to 1800° and the pressure to 33 atm., thus absorbing NO; the gases escape through the exhaust valve into a receiver, forming HNO<sub>3</sub>. (3) A compressor of large capacity compressing flue gases, air and a small amt. of hydrocarbon to 12 atm.; then exploding this mixt. Otherwise same operations as (1)." Cost data are given for various processes showing that the gas engine by-product process, while not the most economical, can compete with other processes in times of stress when speed is essential, and where natural gas is available. F. W. S.

Furnace settings for caustic pots. F. H. NICKLE. *Chem. Met. Eng.* 20, 65-9 (1919).—An article on the design of radial, tangential and reversible series Dutch oven type of furnace settings for countercurrent economizer NaOH pots. The development of the most efficient modern types is discussed. Illustrations and drawings accompany the text. F. W. SMITHER.

Separation of potash salts. H. P. BASSETT. *Chem. Met. Eng.* 20, 76-7(1919).—The author points out that the K salts derived from wood ashes, brines, etc., contain too much admixed salt (Na<sub>2</sub>CO<sub>3</sub>, borax, etc.) for many uses, and urges the chemists of the country to put this industry on a basis that will meet the peace-time demands. From a study of the problem of sepn. the author concludes: "(1) It is almost impossible to sep. a 3-ion system, e. g., K<sub>2</sub>SO<sub>4</sub> and Na<sub>2</sub>SO<sub>4</sub>. This is due either to the formation of double salts or the salting out of one salt by the other on account of common ion. This may be overcome in this instance by the addition of NaCl, which has 2 effects—it produces a 4-ion system and also tends to salt out the salt with a common ion, viz., Na<sub>2</sub>SO<sub>4</sub>. (2) There is that tendency in any 4-ion system to form the greatest opposites possible, e. g., in the above system KCl remains in soln. while the Na<sub>2</sub>SO<sub>4</sub> is pptd. on evapg. the soln. (3) The presence of an alkali or a salt acting as an alkali tends to throw down the heavy acid salts as they exist in soln.; e. g., in a soln. containing Na<sub>2</sub>CO<sub>3</sub>, AcONa, Na<sub>2</sub>SO<sub>4</sub> and K<sub>2</sub>SO<sub>4</sub>, the 2 latter salts will tend to be thrown down in the proportion in which they occur in soln., and this condition will be nearer and nearer approached on evapg. the soln. on account of the increase in concn. of the alkali salt. Hence, when an alkali salt is present, salts like K<sub>2</sub>SO<sub>4</sub> and Na<sub>2</sub>SO<sub>4</sub>, KCl and NaCl will have to be thrown out of soln. to free them from Na<sub>2</sub>CO<sub>3</sub> and then sepd., adhering to the 4-ion system. As to how these 3 so-called laws shall be operated depends on local conditions and original compn. of the brines to be dealt with." The author reports in detail lab. results obtained on a brine, showing that it is feasible to

produce K salts of high grade and to recover the other products in marketable form.

F. W. SMITHER.

**Potash salts in the United States of America.** ANON. *Agr. Gas. N. S. Wales* 29, Pt. 10, 716(1918).—The production of available  $K_2O$  in 1917 was 32,366 tons, which is 12% of the amt. of  $K_2O$  imported in a normal year. The amts. from inorg. and org. sources are tabulated and reported with approx. value at shipping points.

R. B. DEEMER.

**The manufacture of barium chloride.** H. TOUSSAINT. *Ind. chim.* 5, 250-2 (1918).—Early processes are reviewed. In the Kolb-Duflos 240-250 kg. of finely ground barytes (93-95%  $BaSO_4$ ) and 85-90 kg. of pulverized coal are thoroughly mixed in a hollow cylinder, and then 160-170 kg. of a 70-75%  $CaCl_2$  soln. are added. The mixt. is fused in a hand-operated furnace, where it is heated for 4 hrs. at 900-1000°. During the operation, it is important to stir the mass frequently. A good fusion is indicated by a grayish fracture with black specks of unchanged C. Lixiviation takes place in vats ( $3 \times 3 \times 1.5$  m.), provided with perforated false bottoms. Each vat is charged with 28-30 fusions coarsely broken up and contg. 50-60%  $BaCl_2$ . Hot water is added and the temp. is brought to boiling by live steam. When the soln. reaches 30-31° Bé., the operation is stopped and the liquor is removed through an outlet, while cold water is added until the d. becomes 24° Bé. After the strong liquors have been withdrawn, the sediment on the false bottom is washed with water until a minimum d. of 1° Bé. is reached. The weak liquors are used instead of fresh water to ext. future fusions. The residues should not contain more than 0.5%  $BaCl_2$ . The sol. sulfides are removed from the strong liquor, after settling, by means of  $CO_2$  and steam, S being pptd. The clear soln. is then decanted, neutralized with HCl and concd. in suitable app. to 30° Bé. Crystals of  $BaCl_2 \cdot 2H_2O$  begin to form at this point and the crystn. is allowed to continue to completion. The crystals are dried and packed into sacks or barrels. To obtain anhydrous  $BaCl_2$ , the crystg. soln. is vigorously agitated. The product is calcined. 95% pure  $BaCl_2$ , containing but little  $H_2O$  and  $CaCl_2$ , is obtained. When  $CaCl_2$  is not available, barytes is reduced at 1000-1100°, according to the reaction:  $BaSO_4 + 4C \rightarrow BaS + 4CO$ . This process is described. A product running 60-70% sol. BaS is obtained. 20-25% is sol. in acids (carbonate and silicate) and 5% is insol. BaS can be converted into  $BaCl_2$  by means of HCl. Care must be taken to remove the  $H_2S$  fumes, which can be oxidized to  $H_2SO_4$ . Wooden vats, furnished with agitators and closed by covers provided with fume vents, hoppers for the introduction of the BaS and earthenware tubes extending to the bottom of the app. for adding the acid, are used. The acid is added first, then the BaS, a little at a time. At the finish, the charge is heated by direct steam to drive out the  $H_2S$ . Tumeric paper is used to control the operation. The paper should remain slightly brown in color at the completion of the reaction. From this point on, the procedure is identical with the above. Patents have been issued on the use of Cl,  $MgCl_2$  and  $FeCl_3$  in the conversion of the sulfide.  $CO_2$  may be used to convert BaS into  $BaCO_3$  directly, but the process requires a  $CO_2$  installation. A Belgian process consists in dissolving BaS with  $Na_2CO_3$ , forming  $Na_2S$  and  $BaCO_3$ , gaining thereby, a valuable by-product.  $BaCl_2$  may be manufactured from  $BaCO_3$  directly, but the process is costly, due to the use of  $K_2CO_3$  in converting  $BaSO_4$  to  $BaCO_3$  (Fr. Pat. 408,357). ISMAR GINSBERG.

**A special bleaching powder for use in hot countries.** T. RETTIE, J. L. SMITH AND J. RITCHIE. *J. Soc. Chem. Ind.* 37, 311-317(1918).—See C. A. 13, 249.

F. W. S.

**Manufacture of arsenic trichloride.** R. C. SMITH. *J. Ind. Eng. Chem.* 11, 109-10 (1919).—A description, with illustration of app., of the process based on the reaction:

$2\text{As}_2\text{O}_3 + 6\text{S}_2\text{Cl}_2 \longrightarrow 4\text{AsCl}_3 + 3\text{SO}_2 + 9\text{S}$ . Based on the  $\text{S}_2\text{Cl}_2$  used the yield was 93%. F. W. SMITHER.

The Chilean nitrate industry during 1918. DONALD F. IRVIN. *Eng. Mining J.* 107, 265-7 (1919); cf. *C. A.* 12, 2043. E. H.

Production of gas defense equipment for the army. Another creditable chapter of American manufacturing achievement during the war. BRADLEY DEWEY. *J. Ind. Eng. Chem.* 11, 185-97 (1919).—An interesting illustrated story of the development "from the acorn stage to the great oak in mushroom time" of poison gas defense equipment production in the U. S., in which are included a description of the respirator furnished the U. S. Army, its manuf. and inspection, an outline of the organization which accomplished this work and its personnel, and a discussion of the equipment and work of the several tech. labs. for research and control work. Besides respirators both for men and horses (1) there were produced dugout blankets, (2) suits and gloves for protection of the body against mustard gas, (3) protective ointments for the skin to protect against mustard gas burns, (4) warning signals, (5) trench fans and (6) inhalators. E. J. C.

Physical chemistry and its bearing on chemical and allied industries (PHILIP) 2. Storage tanks made of reinforced concrete (FRERICHS) 20. Widening demand for blast furnace slag (WRIGHT) 9.

BARBET, ÉMILE: *Rectification de l'air liquide. Séparation et purification des gaz de l'atmosphère.* Paris: H. Dunod et E. Pinat. 139 pp. 7 francs 20. For review see *Rev. produits chim.* 21, 417 (1918) or *l'Industrie chimique* 6, 32 (1919).

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JAUÉGUY, PIERRE, FROMENT, H.-B. AND STÉPHEN, R.-E.: *l'Industrie allemande et la guerre.* Paris: H. Dunod et E. Pinat. 160 pp. 7 francs 20. For review see *l'Industrie chimique* 5, 336 (1918) or *Rev. produits chim.* 21, 419 (1918).

ROUSSET, CAMILLE: *Annuaire des produits chimique et de la droguerie.* 42nd Ed. Paris: Camille Rousset, 114 place Lafayette. 1900 pp. 30 francs. For review see *l'Industrie chimique* 5, 336 (1918).

Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry. Vol. II, 1917. London: The Society of Chemical Industry, Central House, Finsbury Square, E. C. 2. 509 pp. 6s. 6d post free. (4s. 6d. to Members of the Society). For review see *Intern. Sugar J.* 21, 34 (1919) or *Analyst* 44, 38 (1919).

Year Book of Pharmacy, 1918, Comprizing Abstracts of Papers Relating to Pharmacy, Materia Medica and Chemistry, with the Transactions of the British Pharmaceutical Conference held in London in July, 1918. Edited by J. O. Braithwaite and R. R. Bennett, with a section on New Remedies by Thos. Stephenson. London: J. & A. Churchill. 516 pp. For review see *Perfumery & Essent. Oil Record* 10, 10 (1919).

**Nitric acid.** NORSK HYDRO ELEKTRISK KVAHLSTOFAKTIESELSKAB. Brit. 120,378, Sept. 19, 1918. The production of concd.  $\text{HNO}_3$  from N peroxide or other oxides of N is effected by passing the gas together with O and  $\text{H}_2\text{O}$  or dil.  $\text{HNO}_3$  under pressure through a series of reaction vessels, so arranged that the current of O passes in the same direction as the liquid through each individual reaction vessel, while the O and liquid pass in opposite directions through the app. as a whole. The process may be carried out at a pressure of 10 atm. and a temp. of  $70^\circ$ . App. for use in carrying the process into effect is described. Cf. C. A. 12, 2113.

**Nitric acid.** B. DAWSON. Brit. 120,869, Sept. 4, 1918. In the absorption of N oxides in an upward spray of  $\text{H}_2\text{O}$  and air in an empty tower in which the spray is produced by a jet of compressed air opening below the surface of  $\text{H}_2\text{O}$  in the bottom of the tower, the jet is surrounded by an inverted funnel having holes, the upper part of the funnel being above the level of the  $\text{H}_2\text{O}$ . This arrangement prevents irregularities in the working of the jet owing to variations in the level of the  $\text{H}_2\text{O}$ .

**Concentrating waste acids.** J. N. BROOKE. Brit. 120,951, Nov. 8, 1917. Waste acids contg.  $\text{HNO}_3$ , such as are produced in making picric acid, are concd. in earthenware, enamelled, or other acid-proof vessels provided with coils or jackets through which pressure or superheated steam is circulated. A battery of vessels, each fed from a pipe and discharging into a trough, may be used, the vapors being led to a fume pipe. Alternatively, the vessels may be arranged so that the acid flows through them in series.

**Distilling ammonia.** G. WILTON. Brit. 120,596, Oct. 11, 1917. The hot spent liquors from an  $\text{NH}_3$  still are subjected to reduced pressure in an evaporator in order to disengage the residual  $\text{NH}_3$ , and the vapors so obtained are led through a concentrating column surmounted by a reflux condenser to a coil condenser from which the  $\text{NH}_3$  is led to a receiver which is placed at a low level so as to create or assist in creating the requisite vacuum. A vacuum pump may be connected to the receiver. The evaporator is fitted with deflector plates which cause the liquor to take a sinuous course, and may be provided with heating coils. Less steam than usual may be supplied to the still with the result that a larger proportion of the  $\text{NH}_3$  is obtained in the vacuum plant.

**Ammonia; cyanogen compounds.** H. BAKER. Brit. 120,759, Nov. 16, 1917. The residual liquor left after the distn. of gas liquor with lime or the like is boiled down with  $\text{Na}_2\text{CO}_3$  or  $\text{K}_2\text{CO}_3$  to decompose certain cyanogen compds. with the production of  $\text{NH}_3$ . A compd. of a metal other than Hg is then added to ppt. the remaining cyanides and thiocyanates, or the liquor may first be used as often as desired instead of lime for the distn. of gas liquor, alkali carbonate being added as described above at each operation, the residual liquor being finally pptd. as described above. The pptd. cyanides and thiocyanates may be sepd. from the alk. liquor, which may then be used instead of lime for the distn. of gas liquor or for dissolving the metal compd. used for the pptn. of the cyanides in a subsequent operation; or the liquor, contg. the ppt., and it may be also  $\text{CaCO}_3$  derived from the lime originally used in the distn., may be evapd. to dryness. Spent oxide from gas purifiers is washed or boiled with soln. of alkali carbonate and the soln. obtained is concd. to decompose certain cyanogen compds. and then pptd. as above described. The pptd. cyanides and thiocyanates or the mixt. obtained in the evapn. to dryness above described, or the cyanogen compds. obtained according to 110,819 and 112,329 are heated with or without the addition of alkali carbonate and in the presence or absence of air to obtain  $\text{NH}_3$ . In the presence of air, an oxide is obtained which may be used again, and as the  $\text{NH}_3$  is first liberated and subsequently  $\text{SO}_3$ , it is possible to collect them sep. In the absence of air, a sulfide is obtained which may be roasted to obtain a soln. which, after neutralization, may be used for the pptn. of the cyanides as above described.



**Nitrates by bacterial action.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,288,754, Dec. 24. Nitrate-forming bacteria are allowed to act upon 1  $m^3$  of nutrient soln. containing 150 kg.  $\text{Ca}(\text{NO}_3)_2$  and 8 kg.  $(\text{NH}_4)_2\text{SO}_4$  until the soln. is completely oxidized and contains 160 g.  $\text{Ca}(\text{NO}_3)_2$  per l. 60 l. of this soln. are sepd. and to the remainder there are added  $\text{H}_2\text{O}$  60 l.  $(\text{NH}_4)_2\text{SO}_4$  8 kg. and a combining proportion of  $\text{CaCO}_3$  for the continuation of the process. In another and preferred manner of carrying out the oxidation, 1  $m^3$  of soln. is formed containing  $\text{Ca}(\text{NO}_3)_2$  150 kg. and  $\text{NH}_4\text{NO}_3$  10 kg. At complete oxidation, a soln. is obtained which contains 170 g.  $\text{Ca}(\text{NO}_3)_2$  per l. 120 l. of this soln. are sepd. and transformed into  $\text{NH}_4\text{NO}_3$ , a portion of which is added to the residual 880 l. of soln. from the first oxidation for continuation of the process.

**Nitrates by bacterial action.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,288,755, Dec. 24. In the oxidation of  $\text{NH}_3$  or  $\text{NH}_4$  compds. to nitrates by the action of bacteria in mellow soil or other nutrient, the deleterious action of molds or other enemies of nitrifying bacteria is prevented by the addition of small amts. of  $\text{PhOH}$ ,  $\text{CuCN}$ ,  $\text{NaCN}$ ,  $\text{NaF}$ , aniline or other poisons which are harmless to the nitrifying bacteria.

**Nitrates by bacterial action.** C. T. THORSSELL and H. L. R. LUNDEN. U. S. 1,288,756, Dec. 24. A porous solid substratum material such as peat or sponge carrying nitrifying bacteria is mixed with  $\text{CaCO}_3$  and perforated trays containing this material are placed one above another. A soln. of  $\text{NH}_4$  salts to be oxidized is allowed to percolate through the material in the trays while exposed to free access of air.

**Potassium chloride from brines.** J. W. HORNSEY. U. S. 1,288,592, Dec. 24,  $\text{KCl}$  is sepd. from a soln. containing also  $\text{NaCl}$ , borax,  $\text{Na}_2\text{SO}_4$  and  $\text{Na}_2\text{CO}_3$  by treating the soln. with  $\text{CO}_2$  to remove the carbonate, filtering off the soln. and evapg. the filtrate to remove  $\text{NaCl}$ , cooling and dilg. the soln. and pptg.  $\text{KCl}$  and borax, and then by successive evapns. and coolings removing  $\text{NaCl}$  and  $\text{Na}_2\text{SO}_4$  as a result of the evapns. and removing borax and  $\text{KCl}$  as a result of the coolings, sepg. the borax and  $\text{KCl}$  by dissolving to form a soln. having a sp. gr. of 1.12–1.22 at a temp. of  $95^\circ$ , cooling to ppt. borax from the soln. and then, after sepn. of the borax, concg. and cooling to ppt.  $\text{KCl}$ . U. S. 1,288,593 specifies a similar method, in which the filtrate obtained after sepn. of  $\text{KCl}$  may be returned to the cycle for more complete recovery of the borax and  $\text{KCl}$ .

**Separating borax and potassium chloride from solutions.** J. W. HORNSEY. U. S. 1,288,591, Dec. 24. Solns. containing both borax and  $\text{KCl}$  are dild. to a sp. gr. of 1.12–1.22 at a temp. of about  $95^\circ$ , cooled to about  $5^\circ$  to ppt. borax, and, after sepg. the borax from the soln., the latter is concd. at a temp. of about  $95^\circ$  and then again cooled to ppt.  $\text{KCl}$ .

**Calcium hypochlorite.** A. HOFFMANN and A. H. KROFF. U. S. 1,288,587, Dec. 24. The object of the invention is to prep. a uniform compn. suitable for purifying  $\text{H}_2\text{O}$  and containing a standardized % of  $\text{Cl}$  and insol. matter. Three sep. portions of com.  $\text{Ca}(\text{OCl})_2$  each of equal wt. are used in making up the product. One portion is given no special treatment, a second portion is heated to about  $50^\circ$  in a closed chamber for 4–5 weeks partially to convert it into  $\text{CaCl}_2$ , and the third portion is allowed to stand in contact with the air for 1–2 weeks. By mixing these three portions together a material is obtained containing  $\text{Ca}(\text{OCl})_2$  65%,  $\text{CaCO}_3$  5% and  $\text{CaCl}_2$  30%, which is neither dusty nor sticky.

**Titanium hydrates.** M. FLADMARK. U. S. 1,288,863, Dec. 24. Hydrates, hydrated oxides or hydrated salts of  $\text{Ti}$  are pptd. from concd. solns. of  $\text{Ti}$  compds., e. g., a soln. containing 80–350 g.  $\text{TiO}_2$  per l. and 82–410 g.  $\text{SO}_3$  per l. not bound to bases other than  $\text{Ti}$  (such as the solns. obtained by decomposing ilmenite with  $\text{H}_2\text{SO}_4$  in

the manner described in Norwegian pat. to Jebsen, No. 27,292), by heating the solns. in a Pb-lined vessel. The heating may be carried out at the b. p. of the soln. or the reaction and pptn. may be hastened by heating in an autoclave under pressure. A ppt. may be obtained carrying 15-25% combined  $H_2O$ , 3-7%  $SO_3$ , a small amt. of Fe oxide and the remainder  $TiO_2$ .

**Sodium sulfide.** E. M. SYMMES. U. S. 1,289,016, Dec. 24.  $Na_2S$  is produced by fusion of  $Na_2SO_4$  with C in a container of corrosion.

**Ammonium sulfate.** S. E. LINDER. Brit. 121,082, June 3, 1918. Neutral  $(NH_4)_2SO_4$  is produced by adding to the slightly acid sulfate a small proportion of  $(NH_4)_2CO_3$  in the solid state or in soln. in sufficient  $H_2O$  merely to moisten the sulfate, or partly in the solid state and partly in soln. in sufficient  $H_2O$  merely to moisten the sulfate.

**Lead arsenate.** J. LYTLE. Brit. 121,101, Aug. 19, 1918. Pb arsenate is produced by thoroughly mixing, preferably by rubbing or grinding,  $PbCO_3$  or white Pb with  $H_3AsO_4$  in the presence of  $H_2O$ . A concd. soln. of  $H_3AsO_4$  may be used, and  $H_2O$  may be added at the end of the reaction, to produce a paste of the desired consistency.

**Alumina; ammonium sulfate.** J. P. LARSON and W. D. BERGMAN. Brit. 120,550, Aug. 26, 1918. Clay, bauxite, or other natural substance containing Al together with Fe and  $SiO_2$  is treated with  $H_2SO_4$  to yield an impure soln. of  $Al_2(SO_4)_3$ . The soln. is treated with a reducing agent such as  $SO_2$  or a sulfite to reduce ferric to ferrous sulfate, and is mixed while at 70-100° with  $(NH_4)_2SO_4$ , allowed to settle at this temp., and the decanted soln. cooled to sep. crystals of  $NH_4$  alum. The crystals are decomposed by exposing them to  $NH_3$ , either gaseous or in soln., to yield  $(NH_4)_2SO_4$  and  $Al(OH)_3$ , which may be heated to obtain  $Al_2O_3$ .

**Alumina.** E. E. and P. C. DUTT. Brit. 120,638, Mar. 4, 1918. A mixt. of calcined clay or bauxite, or both, with Ca or other alk.-earth chloride is heated to bright redness in a stream of  $As_2O_3$  vapor, producing  $AsCl_3$  which is decompd. by steam into  $As_2O_3$  and HCl, and an aluminate. The residue is dissolved in HCl and treated with Ca aluminate to ppt.  $Al_2O_3$  and to re-form  $CaCl_2$ , which, after the addition of some lime to ppt. the Fe, may be used again.

**Thorium compounds.** J. V. CLARKE and W. A. CLARKE. Brit. 120,748, Sept. 21, 1917. Solns. contg. Th, obtained, *e. g.*, by dissolving in  $H_2O$  the product of the action of  $H_2SO_4$  on monazite sand, are treated with oxidizing agents such as  $KMnO_4$ , or  $NaMnO_4$ , or  $H_2O_2$  in the presence of acid. Hydrated Th oxide or peroxide is pptd. and may be dissolved directly in  $HNO_3$  or other acid, and the resulting soln. may be crystd. The Th nitrate may be purified by pptn. by the oxidizing agent first employed, or the soln. may be treated with  $Na_2CO_3$  in excess, which dissolves the Th carbonate first produced. The soln. is filtered and treated with NaOH to ppt. Th hydroxide, which is then dissolved in  $HNO_3$ .

**Preparing decolorizing carbon.** R. HAYASHI and KWANTO SANJO KABUSIKI KAISHA. Brit. 121,035, Feb. 11, 1918. Decolorizing C is made by soaking sawdust, chaff, etc., in a soln. of  $CaH_4(PO_4)_2$ , or by sprinkling the material thus soaked with  $NH_4OH$ , carbonizing the same, extg. the Ca phosphate with  $H_3PO_4$ , and washing. During the final washing, a part of the  $H_3PO_4$  may be allowed to remain and the C then used for filtering crude sugar sirup, while the filtered sirup may be added to beverages to impart the flavor of  $H_3PO_4$ .

**Albumins.** S. SAROW. Brit. 121,141, June 28, 1917. Albumins are extd. in a pure and undenatured condition from soy bean and other vegetable materials by crushing the raw material, removing oil therefrom by a solvent, then removing the solvent

by a vacuum or by air at a low temp., then extg. the albumins by means of  $H_2O$ , alkali or salt soln., or other non-alc. liquid which will not denature the albumins, removing colloidal, etc., impurities from the ext. until a transparent clear soln. is obtained, and finally pptg. the albumins from the clear soln. The removal of impurities from the ext. may be effected by first passing the ext. through a centrifugal separator and then filtering and fractionally pptg. the liquid by adding a little  $H_2SO_4$  or  $H_2SO_3$ , allowing to stand, decanting, and filtering; another method consists in carefully pptg. the albumins together with impurities by an acid ( $H_2SO_4$  or  $HOAc$ ), decanting, redissolving the albumins in dil.  $H_2SO_3$  or  $HCl$ , and filtering. The wet albumins may be finally dried *in vacuo*, and are suitable for use in the manuf. of plastic materials, etc.

Obtaining products by destructive distillation. E. L. RINMAN. Brit. 120,724, Oct. 30, 1918. Various products ( $NH_3$ ,  $CH_3OH$ , acetone, paraffins, lubricating oils, wax, etc.) are obtained by the dry distn. of mixts. of organic acids with strong bases. The process is particularly applicable to waste lyes from soda-cellulose manuf., waste lyes obtained by dissolving vegetable substances in boiling  $NaOH$  soln.,  $Na$  salts of resin acids and fatty acids obtained, *e. g.*, by treating wood with  $NaOH$ , liquors obtained by boiling waste sulfite-cellulose lyes with  $Ca(OH)_2$ , and waste liquors obtained in the treatment of vegetable textile fibers with alkalies. The distn. is carried out in stages, each stage corresponding with the production of a specific product or products, which are thus collected separately. The heating is preferably effected by the introduction of superheated steam, or superheated steam mixed with the distn. gases. Examples are given of the treatment of waste liquor obtained in the treatment of straw with  $NaOH$  lye, waste soda-cellulose liquor, waste liquor obtained by dissolving wood in  $NaOH$  lye, resin acids and fatty acids, waste liquors from retting flax with  $NaOH$  or the treatment of esparto with  $NaOH$ , and the liquor obtained by boiling waste sulfite-cellulose lye with  $Ca(OH)_2$ .

Catalytic apparatus; hydrogen; ammonia; nitric acid; heat-exchangers; distilling. GEN. CHEM. CO. Brit. 120,546, Feb. 28, 1918. A mixt. of three vols. of  $H$  with one vol. of  $N$  for the synthesis of  $NH_3$  is produced by blowing a producer alternately with air and with air and steam in regulated proportions and then adding steam and passing the gases over a catalyst to convert the  $CO$  into  $CO_2$  and  $H$ , the  $CO_2$  being then sepd. The  $N-H$  mixt. after purification is passed through a catalytic app. for the production of  $NH_3$ , which is then oxidized to produce  $N$  oxides in another catalytic app. Dil.  $HNO_3$  is produced from the gases and this is then concd. by means of air and  $H_2SO_4$  in a distg. app. A suitable construction, with operation, is specified.

Catalytic agents. G. FRABETTI. Brit. 120,551, Sept. 3, 1918. Platinized asbestos, for use as a catalyst, is prepd. by dissolving  $Pt$  in aqua regia, evapg. the soln. to dryness, extg. the residue with  $HCl$ , neutralizing the soln. with  $Na_2CO_3$ , mixing it with a paste of asbestos and distd.  $H_2O$ , and reducing at  $60^\circ$  by  $HCOOH$ ; the product is finally washed, dried, carded, and made into flakes.

Fireproofing compositions. S. A. WALTON. Brit. 120,421, Nov. 6, 1917. In fireproofing wood, cloth, paper, metals, etc., coating or impregnating the object to be fireproofed with a compd. containing a pptd. double borate of  $Zn$  and  $Al$  and a colloidal medium. The double borate of  $Zn$  and  $Al$  is formed by dissolving mol. proportions of  $ZnSO_4$  and  $Al_2(SO_4)_3$  in hot  $H_2O$  and adding to the boiling soln. the requisite quantity of borax to ppt. the double borate. The fireproofing compn. is formed by suspending the ppt. in a colloidal medium, preferably one formed by dissolving 4 oz. gelatin in a gal. of  $H_2O$  at  $90^\circ$  and adding 12 oz. of  $NH_4Cl$ , the temp. being maintained until effervescence ceases. When subjected to great heat, the compd. forms an amorphous glaze which offers great resistance to high temp. or flame.

**Refractory compositions.** G. MARSH. Brit. 120,471, Dec. 3, 1917. Ground furnace slag, slate waste, infusorial earths, and similar materials in admixt. with portland, Roman, or hydraulic cement, and, if desired, plumbago, are mixed with a soln. of a protein substance such as casein, blood, glue, or gelatin. The soln. may contain also Na or K silicate, with or without addition of borax, boric acid, or  $\text{NH}_3$ . The mixt., when dried, is intended for use as a refractory material. Slate dust, slate waste, marble, granite, or similar material, mixed with portland, Roman, or hydraulic cement is mixed also with a similar soln. to form artificial slate.

**Containers for fluids.** G. H. HADFIELD and A. E. BAWTREE. Brit. 120,934, Nov. 26, 1917. Tubes of cardboard or other porous material, to be used for making containers for fluid, are rendered impervious by coating the interior surface with a colloid such as gelatin, which is hardened by an agent applied previously. The hardening agent may be incorporated in the material of the tube during its manuf.

**Ink ribbons.** B. L. BEALL. Brit. 121,114, June 27, 1918. Ink ribbons are woven from pure undyed silk and, before being impregnated with ink, are treated with a soln. of  $\text{SnCl}_4$  or other salt of Sn.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**The nature of the air content of pugged clays.** H. SPURRIER. *J. Am. Ceram. Soc.* 1, 584-5(1918).—A sample of the occluded gas from pugged clay showed:  $\text{CO}_2$  3.85,  $\text{O}_2$  13.46,  $\text{CO}$  1.92,  $\text{N}_2$  80.77%. C. H. KERR.

**Sudanese pottery.** F. STIRK. *Trans. Eng. Ceram. Soc.* 17, 226-35(1918).—River Nile mud is used. Wares are built up by hand and fired by placing in pits and covering with fuel. C. H. KERR.

**Note on a firebrick from the crown of an electric steel-melting furnace.** W. J. REES. *Trans. Eng. Ceram. Soc.* 17, 248-9(1918).—Samples from a fire brick crown of a half-ton Greaves-Etchells furnace which had lasted 145 charges showed the following analysis:  $\text{SiO}_2$ , 51.83;  $\text{Al}_2\text{O}_3$ , 38.73;  $\text{TiO}_2$ , 6.68;  $\text{Fe}_2\text{O}_3$ , 1.56;  $\text{CaO}$ , 0.31;  $\text{MgO}$ , 0.19;  $\text{K}_2\text{O}$ , 0.59;  $\text{Na}_2\text{O}$ , 0.32%. Softening point was cone 37. The fluxed end of the brick showed abundant development of sillimanite. These bricks were made from a newly discovered bauxite clay containing numerous spherulites of bauxite. It is almost non-plastic and requires a plastic clay bond. Samples have analyzed up to 50%  $\text{Al}_2\text{O}_3$  and up to 10%  $\text{TiO}_2$  and softening points have run from cones 32 to 38. C. H. KERR.

**Corrosive action of flue dust on fire bricks.** J. W. MELLOR. *Gas J.* 144, 421-3 (1918).—A report of the Refractory Materials Committee to the Institution of Gas Engineers (England). Trials were made in a small furnace 18" high, 18" wide by 9" deep, heated by air blast with air at 3-4 lbs. and town gas at 3-4 in. pressure, both preheated to 350-400° by an auxiliary burner. A tube running down the center of the burner carries the dust under test. It is sucked into the burner blast and projected downward on to the test brick. Uniform furnace conditions were maintained for 1/2 hr. both before and after the period of feeding in dust. The following dusts were tried: (1) boiler flue dust of a slate-brown color, (2) boiler flue dust of a brown color, (3) deep red dust from the top of the retort-bench of a gas-works, (4) dust from the slag-chamber between a steel-smelting furnace and the regenerator, (5) dust from a blast-furnace Cowper stove, (6) bull dog, (7) red hematite ore, (8) top cinder, (9) lime from calcined marble, (10) equal amts. of  $\text{CaO}$  and  $\text{NaCl}$ , (11) salt, (12)  $\text{Na}_2\text{SO}_4$ , (13) equal amts. of salt and potash spar, (14) equal amts. of Na and Ca silicates. Analyses of the flue dusts follow:

|                                                | 1.    | 2.    | 3.    | 4.    | 5.    | 6.    | 7.     | 8.    |
|------------------------------------------------|-------|-------|-------|-------|-------|-------|--------|-------|
| Silica, $\text{SiO}_2$ .....                   | 18.33 | 44.98 | 20.40 | 28.76 | 13.76 | 15.60 | 6.80   | 3.05  |
| Titanic oxide, $\text{TiO}_2$ .....            | n. d. | 0.82  | 0.67  | 0.61  | 0.13  | n. d. | n. d.  | n. d. |
| Alumina, $\text{Al}_2\text{O}_3$ .....         | 2.92  | 9.50  | 10.07 | 8.32  | 7.12  | 0.68  | 1.40   | 0.35  |
| Ferric oxide, $\text{Fe}_2\text{O}_3$ .....    | 45.34 | 32.38 | 55.86 | 43.60 | 26.60 | 8.76  | 89.94  | 25.86 |
| Manganese oxide, $\text{MnO}$ .....            | n. d. | n. d. | n. d. | 0.99  | 2.08  | n. d. | n. d.  | 1.40  |
| Magnesia, $\text{MgO}$ .....                   | 2.26  | 1.18  | 0.55  | 0.83  | 2.16  | 0.85  | trace  | 0.40  |
| Lime, $\text{CaO}$ .....                       | 12.48 | 3.54  | 2.25  | 10.92 | 9.10  | 1.30  | 0.96   | 0.26  |
| Potash, $\text{K}_2\text{O}$ .....             | 1.40  | 3.62  | 2.60  | 1.74  | 6.61  | nil   | } 0.33 | nil   |
| Soda, $\text{Na}_2\text{O}$ .....              | 1.30  | 0.32  | 0.74  | 0.32  | 1.66  | nil   |        |       |
| Loss on ignition.....                          | 4.21  | 3.51  | 3.84  | 0.72  | 8.32  | nil   | nil    | nil   |
| Phosphoric oxide, $\text{P}_2\text{O}_5$ ..... | n. d. | n. d. | n. d. | 3.32  | 1.26  | 6.42  | 0.05   | 0.87  |
| Sulfur trioxide, $\text{SO}_3$ .....           | 11.62 | n. d. | 3.31  | n. d. | 6.48  | 0.62  | n. d.  | n. d. |
| Zinc oxide, $\text{ZnO}$ .....                 | nil   | nil   | nil   | nil   | 15.49 | nil   | nil    | nil   |
| Ferrous oxide, $\text{FeO}$ .....              | n. d. | n. d. | n. d. | n. d. | n. d. | 65.32 | n. d.  | 67.46 |

All dusts were screened through 60 mesh and 120 g. was used in each test. Five typical firebricks were tested (*A* = typical good clay firebrick; *B* = like *A* but somewhat coarser; *C* = fairly coarse good  $\text{SiO}_2$  brick; *D* = fair quality, fine grained  $\text{SiO}_2$  brick; *E* = good, dense, medium-grained  $\text{SiO}_2$  brick). Analyses follow:

|                                             | A.    | B.    | C.    | D.    | E.    |
|---------------------------------------------|-------|-------|-------|-------|-------|
| Silica, $\text{SiO}_2$ .....                | 62.00 | 66.81 | 94.34 | 93.52 | 93.66 |
| Titanic oxide, $\text{TiO}_2$ .....         | 1.09  | 1.52  | 0.36  | 0.36  | 0.26  |
| Alumina, $\text{Al}_2\text{O}_3$ .....      | 31.72 | 27.38 | 1.96  | 2.87  | 2.10  |
| Ferric oxide, $\text{Fe}_2\text{O}_3$ ..... | 3.89  | 2.19  | 0.83  | 0.22  | 1.30  |
| Magnesia, $\text{MgO}$ .....                | 0.42  | 0.35  | 0.06  | 0.26  | 0.06  |
| Lime, $\text{CaO}$ .....                    | 0.47  | 0.22  | 2.04  | 2.50  | 1.44  |
| Potash, $\text{K}_2\text{O}$ .....          | 0.40  | 1.06  | 0.28  | 0.46  | 0.60  |
| Soda, $\text{Na}_2\text{O}$ .....           | 0.21  | 0.69  | 0.21  | ...   | 0.42  |
| Loss on ignition.....                       | ...   | 0.17  | 0.12  | 0.26  | 0.22  |

Results which are given in detail are briefly summarized in the table,

| Dust.                                          | Firebrick. | Silica brick. | Fine-grained silica brick. |
|------------------------------------------------|------------|---------------|----------------------------|
| Boiler dust high in lime and ferric oxide..... | d.P.; m.C. | .....         | .....                      |
| Ferruginous boiler dust.....                   | s.P.; s.C. | .....         | .....                      |
| Ochreous dust from retort bench.....           | k.P.; s.C. | .....         | .....                      |
| Basic slag.....                                | d.P.; s.C. | d.P.; g.C.    | .....                      |
| Ferruginous dust high in lime                  | k.P.; m.C. | d.P.; m.C.    | .....                      |
| Bull dog.....                                  | .....      | d.P.; m.C.    | .....                      |
| Hematite (reducing flame)....                  | .....      | d.P.; s.C.    | s.P.; s.C.                 |
| Tap cinder.....                                | d.P.; g.C. | d.P.; m.C.    | d.P.; s.C.                 |
| Lime.....                                      | s.P.; m.C. | s.P.; m.C.    | .....                      |
| Lime and salt.....                             | s.P.; m.C. | s.P.; m.C.    | .....                      |
| Salt.....                                      | d.P.; s.C. | s.P.; m.C.    | .....                      |
| Sodium sulfate.....                            | s.P.; s.C. | s.P.; m.C.    | .....                      |
| Salt and feldspar.....                         | s.P.; s.C. | s.P.; m.C.    | .....                      |
| Soda-lime glass.....                           | s.P.; s.C. | s.P.; m.C.    | .....                      |

In the table, P = penetration; C = corrosion; s = slight; d = deep; k = complete; m = medium; gC = great corrosion or slagging. In  $\text{SiO}_2$  the bond is the most vulnerable part.  $\text{Fe}_2\text{O}_3$  corrodes fireclay more easily than it does  $\text{SiO}_2$  bricks.  $\text{SiO}_2$

conversions are hastened by the dusts, due possibly to the alk. vapors in the dust. If the dust forms a surface glaze the brick is largely protected from further attack. Further reports will be made by the Committee.

C. H. KERR.

Our knowledge of the refractory products industry. J. BURN. *Chim. & ind.* 1, 579-600(1918).—A review of the progress, during the war, of the French refractory products industry. *Dolomitic bricks*: The disintegration of dolomitic furnace bricks before use, as a result of slaking, may be greatly reduced by mixing 5-6% of kaolin with the dolomitic carbonate before burning it. In making the bricks, the calcined dolomite is mixed with boiled tar, and pressed under 400-500 kg./cm<sup>2</sup>. pressure. They are stable for only 2-3 days and should be used at once. However, they are as stable with respect to slaking as bricks made from "dead burned" magnesium carbonate, and may replace them in localities where dolomite is more abundant than MgCO<sub>3</sub>. *Magnesia*. Before the war France was largely dependent on Styrian magnesia for furnace blocks, but during the war MgCO<sub>3</sub> from Greece (Euboea) and Italy (Caglian-cello) was calcined in France. Grecian magnesia contains less Fe<sub>2</sub>O<sub>3</sub> than Styrian magnesia, and requires a correspondingly higher temp. for burning. Also, bricks made from it slake rather easily and exhibit considerable shrinkage when submitted to prolonged high temp. The Italian MgCO<sub>3</sub> deposits contain siliceous and calcareous concretions, the removal of which increases the cost of prepg. it. MgO bricks are molded under a pressure of 500 kg./cm<sup>2</sup>. with no binder except H<sub>2</sub>O, and then burned at 1550°. *Silica-alumina products*: The behavior of kaolinite (argil) blocks when subjected to pressure at high temp., was studied. The resistance to pressure is increased by replacing some of the clay by pure silica sand, and molding dry (8-10% H<sub>2</sub>O) under a pressure of 200-400 kg./cm<sup>2</sup>. Also, the addition of 10% of fat coal helps. Blocks composed of 1 part sand and 1 part kaolin withstood 10 kg./cm<sup>2</sup>. at 1200°, and 4 kg. at 1460°. *Silica bricks*: The manuf. of silica bricks is described; and the relation between their stability and the transformation of quartz into tridymite and cristobalite is discussed. A silica brick should contain at least 95% SiO<sub>2</sub>; should have a crushing resistance of 150 kg./cm<sup>2</sup>. cold, and at least 20 kg. at 1600°; and should exhibit only slight swelling, which quality is probably assured by its having a density of 2.38 to 2.42.

R. H. LOMBARD.

Electric furnace treatment of refractories. R. S. HUTTON. *Trans. Eng. Ceram. Soc.* 17, 236-43(1918).—An open-hearth steel furnace reaches 1650° and few refractories are burned to or even capable of withstanding that temp. Should not first grade refractories be fired to 2000°? This requires elec.-furnace firing. In the elec. furnace materials may be fully shrunk owing to the high temps.

C. H. KERR.

Heat balance on a producer-gas fired chamber kiln. R. K. HURSH. *J. Am. Ceram. Soc.* 1, 567-77(1918).—Tests were made at the Baker Clay Co., Grand Ledge, Mich., of a 16-chamber kiln and three 6-ft. water-seal pressure producers. *Results*: Total heat input from coal, air, steam and carbon in clay, 100%; heat to raise temp. of clay and drive off water, 43.59%; loss due to sensible heat of flue-gas, 32.35%; loss due to conduction, radiation, etc., from kiln, 8.72%; loss due to conduction, radiation, etc., from producers, 14.72%; loss due to unburned carbon in ashes, 0.62%.

C. H. KERR.

Hydraulic separation as applied to the recovery of fine coals, shales and clays (DRAPER) 1. Refractory materials in gas-works, from a user's point of view (LEATHER) 21.

DUNNICLIFF, H.-B.: *Laboratory Glassware Economy*. London: Macmillan & Co., Ltd.; Saint Martin's St. 92 pp. 4s. For review see *Rev. sci.* 56, 543(1918).

**Refractory material for furnace construction.** L. P. KRAUS, JR. U. S. 1,289,049, Dec. 24. Bauxite or similar material is powdered, mixed with twice its volume of ground wood and molded into blocks with  $H_2O$  and glucose or other binder. The blocks are dried and then roasted at a temp. (preferably about  $160^\circ$  below the m. p.) sufficiently high to produce clinkered material in the form of spongy grains with the cleavage planes destroyed. Air is supplied during the heating to oxidize and remove impurities, and after clinkering the material is crushed to the degree of fineness desired for use. Most of the  $Fe_2O_3$  in the bauxite is eliminated during the process.

**Washing clay.** W. FELDENHEIMER. Brit. 121,191, Dec. 6, 1917. In a process for cleaning clay by treating an aq. suspension first in one vessel with a deflocculator such as weak  $Na_2CO_3$  to enable impurities to settle out and then in another vessel with a flocculator, such as alum soln. which causes the clay to settle, as described in 106,890 (C. A. 11,2607), the flocculating reagent is added so slowly, or in such total quantity relatively to the quantity of the deflocculator, as to cause flocculation or coagulation of the clay, but not rapid sedimentation. By this means, there is obtained a sepn. from the clay in suspension of impurities not ordinarily sepd. therefrom by the deflocculator alone. With certain deflocculators, such as a weak soln. of  $Na_2CO_3$ , a strong soln. of the same material may be used as a flocculator. When  $Na_2CO_3$  is employed, discoloration of the clay may be prevented by the addition of ultramarine prior to the addition of the flocculating agent. Various flocculating and deflocculating agents are described.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Some mix-crystals of calcium ferrite and aluminate. E. D. CAMPBELL. *J. Ind. Eng. Chem.* 11, 116-20(1919).—Continuing his researches on the equil. relations of the oxides composing portland cement clinker, C. has applied his methods of slow cooling to produce large crystals (C. A. 9, 703) and absorption of the liquid phase at a definite temp. (C. A. 7, 3400) to several  $CaO.Fe_2O_3.Al_2O_3$  melts. From pure  $Al_2O_3$ - $Fe_2O_3$  melts only the compds.  $CaO.Fe_2O_3$  and  $2CaO.Fe_2O_3$  could be isolated confirming the work of Sosman and Merwin (C. A. 10, 2673). From a melt of compn.  $8CaO$ -. $3Al_2O_3$  crystals of the compd.  $3CaO.Al_2O_3$  were isolated, though these could not be prepd. from melts of compn.  $4CaO.Al_2O_3$  due to crystn. of  $CaO$  (C. A. 11, 2953). From melts of compn.  $8CaO$ -. $3R_2O_3$  containing 2  $Fe_2O_3$  to 6  $Al_2O_3$  solid solns. containing 1  $Fe_2O_3$  to 7  $Al_2O_3$  were isolated when liquid phase contained less than 3  $Fe_2O_3$  to 5  $Al_2O_3$ . With liquid phase between  $3Fe_2O_3$ -. $5Al_2O_3$  and  $Fe_2O_3$ -. $Al_2O_3$  solid solns. containing 3  $Fe_2O_3$  to 5  $Al_2O_3$  were isolated. All samples were hydraulic. Substitution of  $Fe_2O_3$  for  $Al_2O_3$  decreased the amount of  $CaO$  which could be held in combination. J. S. LAIRD.

**The elasticity of pure cement.** L. JOUAN. *Compt. rend.* 167, 591-3(1918).—The coeff. of elasticity of a small prism of neat cement was detd. in the following manner: One end of the test piece, 38.6 cm. in length, 2.96 cm. wide, 1.43 cm. thick, wt. 286.07 g., d. 1.75, was fastened solidly in a wall; the other end on which the force was applied was gripped in a jaw suspended by its upper hook at the end of a balance beam. A mirror fastened near the knife edge of the beam served to det. the deformation of the test piece by the method of Poggenдорff. By an arrangement of funnels to discharge certain wts. of sand the test piece was subjected to forces alternatively in both directions reaching progressively 500 g. From the formula  $E_f = 4Pl/a^3bf$ , where  $P$  = force in kg.,  $f$  = corresponding deformation in cm.,  $l$  = the distance between points of fixation in the wall and jaw,  $a$  = thickness of the test piece,  $b$  = width,  $E_f = 1.080 \times 10^8$

kg. per sq. cm. With another procedure carried by moving the test piece from its position of equil. and registering the vibrations on a smoked cylinder, 45.5 vibrations per second were obtained. In applying the formula  $E_u = 48\delta\pi^2 N^2 l^4 / (a^3 \times 1.87^4 \times 9.81 \times 10^8)$  in which  $E_u$  is the coeff. of elasticity in kg. per cm.;  $\delta$  the density,  $N$  the number of vibrations per sec.;  $l$  the distance from the fixed end to the movable end of the test piece,  $E_u = 1.074 \times 10^5$  kg. per sq. cm. Further detns. by both methods gave results agreeing very closely with these figures. The expts. show that a given test piece at a given time has a well defined coeff. of elasticity.

H. A. BRIGHT.

**Influence of gypsum on the blast furnace slag used in the manufacture of cement.** E. BERESLAVSKY. *Chem. Met. Eng.* 20, 25-8 (1919).—Puzzolan cement manuf. from slag and quick-lime at the Alexandrook South Russian works of the Briansk Co. gave 35 kg. per sq. cm. at 7 days, 45 kg. at 28 days for neat briquets, and 12 kg. for 7 days, 16 kg. for 28 days for 1 to 3 sand briquets. Pats made of this cement showed constancy of vol. A study was made of this slag in combination with lime and gypsum using both granulated and degranulated slag (slag in which all granulation properties had been eliminated by preliminary heating at a high temp. and subsequent cooling in a closed kiln). A slag cement made of granulated slag and 10% of quick-lime which had a good stress lost its stress upon the addition of 5% of gypsum. Sand briquets made from both granulated and degranulated slags with 4 to 6% of gypsum when placed in water disintegrated and showed deleterious vol. changes. Increasing the amt. of gypsum to 10% gave 10.4 kg. per sq. cm. at 7 days and 23 kg. at 28 days. Additions to 15% of  $\text{CaSO}_4$  gave about the same resistances. After further additions the briquets showed rapid lowering in strength tests. Cements of this type—low lime to gypsum—provided strength requirements are sufficient are perhaps more resistant to sea water and  $\text{H}_2\text{SO}_4$  and if properly prepared should be favorably considered for some classes of marine construction and where resistance to  $\text{SO}_3$  ions is a factor.

H. A. BRIGHT.

**Operating details of an electrically operated cement mill.** ANON. *Elec. Rev.* 74, 210-2 (1919).—Description of process of cement manuf. at the Southwestern Portland Cement Co.'s plant.

C. G. F.

**Storage tanks made of reinforced concrete.** F. W. FRERICHs. *Trans. Am. Inst. Chem. Engineers* 1919, Preprint.—These tanks were of exceptional size and were made of concrete because of steel-plate shortage during the war. Before their erection permeability tests were made both with water and ammonia liquor in four small exptl. tanks which were subjected to systematic tests. The concrete mixt. was 1 part cement, 2 parts sand and 4 parts gravel. To one of them 2% of hydrate of lime was added and to 2 others 2% of com. waterproofing material (stearates). The iron cover was luted on to prevent evapn., as the tests were operated in St. Louis in the summer time. The inside area per exptl. tank was 15.7 sq. ft. and outside area 35.74 sq. ft. After 10 days' drying the tanks were filled with water with the result that the av. evapn. (omitting the first day for satn.) per day per sq. ft. outside area (of 25 sq. ft. atm. exposure) was 2.8 cu. in. for the straight concrete mixt. 1.0 cu. in. for the hydrated lime mixt. and 0.7 and 2.8 cu. in. for the com. stearate mixts. The aqua ammonia tests showed no perceptible decrease in strength during the ten days' exposure to the hot sun. Omitting the first 2 days for satn. of the concrete, the av. evapn. per day per sq. ft. outside area, 25 sq. ft., exposed to the atm., was 3.5 cu. in. for the straight concrete mixt., 1.0 cu. in. for the hydrated lime mixt. and 1.25 cu. in. and 1.02 cu. in. for the stearate mixts. The dried test tanks were then given 3 coats of raw gas tar, the first one thinned down with turpentine (causing penetration of  $1/8$  in.). After drying for a week test with ammoniacal liquor during several months showed no appreciable loss in contents. With this as a basis 3 tanks were built in a concrete pit beside the Mississippi River using Red Wing Portland Cement 1 part, 2 parts sand and 4 parts



washed and screened Meramec gravel. Tanks were 35 ft. inside diam., 26 ft. deep. Walls were 7 in. thick. Roof was 6-in. concrete. Inverted steel man-hole covers were used, which were luted into water, and the whole of the top was water-sealed to prevent gas escaping through the concrete by an annular curb construction. The sides were heeled into circular chases in the floor of the pit. The mortar was of a stiff consistency, thoroughly rammed continuously day and night during erection with continuous upward movement of the form during erection. The forms carried a platform for delivery of material and workmen. The whole was properly stayed and reinforced by steel. The rate of form movement varied from 8 in. per hr. during the cool hrs. to 14 in. per hr. during the heat of the day. Three coats of tar were applied after the tanks were dried. Water test developed slight leakage through lifting-cracks due to slow movement of the forms. These lifting cracks were avoided in the other tanks by more rapid movement. Capacity of each tank was 185,000 gals. and cost approx. \$10,000 exclusive of the tank pit. Also in *Chem. Met. Eng.* 20, 234-6(1919).

JAMES R. WITHROW.

**Water content and concrete strength.** *Eng. Mining J.* 106, 998(1918).—A brief résumé of expts. made at Lewis Inst., Chicago, by D. A. Abrams, to study the effect of various quantities of water on the strength of concrete. A curve is given showing the results of compression tests on 6 × 12 in. cylinders with mixes ranging from 1 part of cement and 9 of aggregate to 1 cement and 2 parts aggregate by vol. A composite curve can be drawn as the effect of proportional changes in the mixing is approx. the same for all mixes of concrete. With the consistency most used in concrete construction which contains about 110 to 115% of water (where 100% is the amt. of water giving max. strength) a concrete is obtained which gives 85 to 90% of the max. strength that can be secured from a given amt. of cement and the same aggregates. As the amt. of water is increased there is a rapid falling in strength. With an amt. of water double that required for max. strength, the concrete has only 20% max. strength. In the "sloppy" concrete often used (135% of water) one-half the strength is lost. Any method that involves puddling, tamping, rolling or vibrating, or the exertion of pressure in any manner, will have a tendency to increase the strength of the concrete regardless of the amt. of water used.

H. A. BRIGHT.

**An advance towards greater economy of fuel and increased output in the dead-burning of magnesite and dolomite and the burning of cement.** E. STEIGER. *Trans. Eng. Ceram. Soc.* 17, 250-9(1918).—The old shaft kilns are practically obsolete. The rotary kilns are standard in cement burning and have received practically all the attention recently. The patented Steiger kiln is a producer-fired shaft kiln with automatic charging and discharging devices and with "perfect heating of the air of combustion." The "rotator" at the bottom accomplishes discharging. The capacity of the kiln is about 14 tons per day, the fuel consumption under 20% of the wt. of burned material (compared with 35-40% in the old kilns) and the power consumption 30 h. p.

C. H. KERR.

**Some factors influencing the time of set of calcined gypsum.** F. F. HOUSEHOLDER. *J. Am. Ceram. Soc.* 1, 578-84(1918).—Increasing % H<sub>2</sub>O decreased viscosity and increased time of set. Vigorous stirring when mixing with H<sub>2</sub>O decreased the time of set. Variation in temp. of the mixing H<sub>2</sub>O had no effect on time of set. C. H. K.

**Volume-temperature correction for creosote oil measurements.** S. R. CHURCH AND JOHN MORRIS WEISS. The Barrett Co. *Proc. Am. Wood Preservers' Assoc.* 1918, 160-6.—The mean coeff. of cubical expansion of coal-tar creosote oil in the liquid phase below 79° should be taken as 0.0007 instead of 0.0008 per ° C. A large and inconst. vol. change takes place when naphthalene is crystallizing or dissolving, so no

accurate correction factor can be established below the temp. where the oil is entirely liquid. The customary practice of basing the purchase and use of creosote on a temp. of 100° F. is commended.

GEO. M. HUNT.

**Tentative specifications for wooden paving blocks for exposed pavements.** H. VON SCHRENK, *et al.* *Proc. Am. Soc. Testing Materials* 18, Pt. I, 625-9, 340-6(1918).—The tentative specifications covering wood used, treatment, preservatives and inspection, are practically the same as adopted by Am. Wood Preservers' Assoc., Jan., 1917 (cf. *C. A.* 11, 695). The only changes in preservatives are increase in max. sp. gr. permitted for coal-tar oil to 1.14 and decrease of min. sp. gr. of fraction 315-55° to 1.09 for both coal-tar oil and distillate oil. A specification for water gas tar is presented as information.

GEO. M. HUNT.

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**Widening demand for blast-furnace slag** (WRIGHT) 9.

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**ESPITALIER, M. G.: Précis pour le calcul des ouvrages en béton armé.** Paris: École spéciale des travaux publics, 3 rue Thénard. 251 pp. For review see *Rev. sci.* 56, 542 (1918).

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**Waterproofing concrete.** A. E. HORN. *Brit.* 120,918, Nov. 19, 1918. A soln. contg.  $\text{NH}_4$  compds. of resinic or resinous acids, with or without  $\text{NH}_4$  compds. of fatty acids, is added to the  $\text{H}_2\text{O}$  mixed with portland cement in making concrete. The resinate may be formed from ordinary resin or colophony or from harder resins including the resin acids of Manila and other copals. Fatty acids which can be used are stearic and oleic or stearic acid mixed with palmitic acid. The stearic acid should be free from lubricating hydrocarbons. Other volatile alkalies such as some of the amines may be used in whole or part substitution for  $\text{NH}_4$ . Preferably resin acid and stearic acid are mixed in mol. proportions. The  $\text{NH}_4$  may be added in quantity to sat. the acids exactly or to leave an excess of  $\text{NH}_4$ , but preferably less  $\text{NH}_4$  is used than is required to combine with the resinic and fatty acids so as to leave some uncombined resin. The proportion of resinate or of mixed resinate and stearate, reckoned as anhydrous, which is added to the cement is from half to two %. The soln. is stated to increase the proportion of colloidal silicates in the cement.

**Road-making composition.** G. ROSS. *Brit.* 120,961, Nov. 26, 1917. A material for surfacing roads is made by mixing preferably 100 parts of earthy material, such as loam, soil, or clay, with 35 parts of  $\text{H}_2\text{O}$  to form a thin mud, and adding in succession 20 parts of asphalt, natural bitumen, or coal-tar pitch, or other artificially prepd. pitch, and 1 part of a solvent for the asphalt, etc., such as dead oil, cresol, or crude carbolic acid. The bitumen may be added in a powdered state, or it may be liquefied by heat. In a modified process, the solvent is sprayed upon the mixt. of bitumen, etc., and mud after the mud has been spread upon the road and when substantially all the  $\text{H}_2\text{O}$  has evapd. therefrom.

**Roofing and like materials.** D. L. IRWIN and E. R. JAMES. *Brit.* 121,205, Dec. 21, 1917. A layer of flexible roofing material, such as tarred felt, is combined with a non-metallic supporting material, such as strawboard, etc. The compd. sheet is rigid, so that it can be applied to the rafters, etc., without any support. The strawboard, etc., may be waterproofed, and the edges of the sheets may be coated with waterproofing material. Cf. 25,589, 1901.

**Heat-insulating building material.** H. CASTOR. U. S. 1,288,834, Dec. 24. Infusorial earth cut from natural deposits is heated to about 1000° to improve its resistance

to handling and the product is then cut into shapes for use as a heat-insulating or building material.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Oxidation and ignition of coal.** RICHARD V. WHEELER. *J. Chem. Soc.* 113, 945-55(1918).—It was found, in conformity with the results of previous investigations, that the absorption of O by newly won bituminous coal is initially very rapid, even at ordinary atm. temps., but that this rapid absorption soon gives place to a slow but long continued absorption. The initial rapid absorption of O at low temps. is not accompanied, so far as could be ascertained, by the formation of water or the oxides of C, but during the second or slow phase of the absorption these products of oxidation of the coal substance make their appearance, the amts. increasing with the temp. of the coal. For a given coal at a given temp. the ratio  $\text{CO}_2/\text{CO}$  in the products of combustion remained appreciably const. throughout the period of long-continued slow absorption of O, the ratio decreasing with increased temp. The following hypothesis was advanced as an interpretation of the results of the research work which had been finished at that time: The reaction responsible for the self-heating of coal is mainly one of attachment of O to mols. of high C content. Subsidiary to this reaction, but playing an important role in detg. the actual spontaneous ignition of coal, is a chem. interaction between the O thus loosely held, with the C-like conglomerate. J. H. YOUNG.

**Method of least squares applied to estimating errors in coal analysis.** J. D. DAVIS AND J. G. FAIRCHILD. *Bur. Mines, Tech. Paper* 171, 36 pp.(1918).—The method of least squares has been applied to estg. the probable limits of error in analyzing samples of coal and it is shown how this method should be applied. The results obtained through the application of the theory of probability would seem to indicate rather clearly what degree of precision may be expected with the coal analysis when the quantities are defined by the actual methods used for the analysis. When the error corresponding to a probability of  $1/2$  is taken, the errors involved in sampling and analyzing coal may be taken to be as follows: In taking the 5-lb. gross sample, about 0.04% of sample is ash in the analysis because of failure to include or exclude impurities represented; in the ash detn. 0.08%; in the moisture detn., 0.04%; in the volatile-matter detn., 0.15%, and in the heating-value detn., 0.15%. Combining these possible errors makes a possible error in calcg. the heating value of coal substance of about 0.18% of the heating value. Now the limit detg. rejection is often taken as the error whose probability is 1 in 1000, which is 4.9 times (or roughly 5 times) the probable error of a single detn.; the outside limit for error in the above detns. may be easily calcd. The limits of error would then be as follows: For sampling, 0.20%; for the ash detn., 0.40%; for the moisture detn., 0.20%; and for the heating-value detn., 0.75%. J. H. YOUNG.

**Distillation of coal at low temperatures.** ANON. *Genie civil* July 7, 1917; *Chem. Met. Eng.* 20, 78-9(1919).—When the distn. of coal is carried out at low temps., it is possible to ext. from the coal all the industrial products of petrol; paraffins, lubricants, benzines and oils. In other words, the distn. products may consist largely of either the paraffin hydrocarbons or of the aromatic hydrocarbons, depending upon the temp. and pressure at which the coal was distd., low temps. being favorable for the formation of the paraffin hydrocarbons. J. H. YOUNG.

**Combustion of lignites and high-moisture fuels.** T. A. MARSH. *Elec. World* 73, 265-7(1919).—Typical analyses of high-moisture fuels of the U. S. and Canada and a summary of experience derived from burning these fuels in power plants. C. G. F.

**Fuel-burning equipment of modern power stations.** JOSEPH G. WORKER. *Elec. J.* 16, 55-60(1919).—A study of the equipment of most modern plants. Numerous analyses of coals and diagrams are included. Of particular interest to the chem. engineer. C. G. F.

**Fuel economizers.** C. V. BOYS. *Nature* 102, 249-50(1918).—For the purpose of increasing the heat efficiency of the domestic fire grate an economizer has been devised in which the flue-gases are diverted on their way to the chimney through 2 upright cylinders standing on each side of the fire place, each cylinder surrounding a concentric pipe which is open above and below. The flue-gases pass through the annular space thus formed on their way to the chimney heating the inner tube and causing a current of warm air to be discharged into the room; also the surrounding air is warmed by contact with the exterior of the flue-gas chambers. The fire remains visible and radiates as usual. JOHN AITKEN. *Ibid* 102, 285(1918).—An outline is given of a fuel economizer that was designed to increase the efficiency of the open fire-grate, but owing to the rapid accumulation of soot it was found to be impractical, and a similar drawback was predicted for the economizer designed by Boys. The objectionable appearance of economizers may be improved by painting them with suitable colors, and it is claimed that all paints, with the exception of Al, rank equally well for heat of wave lengths given out at the temps. employed. C. V. BOYS. *Ibid* 102, 285(1918).—It is pointed out that in the economizer designed by the author the trouble of cleaning is only a minor inconvenience, and provision to make this easy is incorporated in the design. J. A. HARKER. *Ibid* 102, 324(1918).—Exptl. evidence is given in support of the view advanced by Aitken that the color of a hot surface at relatively low temp. has very little influence on the amt. of radiation leaving it. For temp. differences in the region of 100°, it was found that a bright surface of ordinary tin-plate gave off an amt. of radiation equal to only 5-10% of that from a black body. Burnished Cu well cleaned with metal polish gave a lower intrinsic radiation than Sn. A coat of almost any paint, however, regardless of color brings the true radiation up to from 80 to 90% of that of a black body, and a layer of paper varnish, or of celluloid varnish so thin and transparent as to be almost imperceptible has almost the same effect. With Al paint the pure radiation is reduced to from 40 to 55% of that of a black body. It has been found also that in the case of low-pressure steam radiators in the region of 100° almost exactly half the heat leaving the vertical surfaces, if these are of an ordinary character or painted in the usual manner, consists of pure radiation, the remainder being the combined effect of conduction and convection. If the radiators are metallized by painting with Al paint, the amt. of heat reaching the middle of a room warmed by such radiators would be lowered to one-half, or double the amt. of heating surface would be required to produce the same radiation effect as if the surface were black or of bare metallic Fe. R. C. PARSONS. *Ibid* 102, 324-5(1918).—A description is given of an app. for economizing fuel that has been in operation for the past 20 years without causing any trouble, or requiring any repairs. JOHN AITKEN. *Ibid* 102, 346-7(1919).—Fuel economizers may be used in connection with stoves as well as with open fire-grates and in this way much better heating is obtained with a greatly reduced consumption of fuel.

W. H. ROSS.

**Blue water gas in conjunction with benzene recovery.** E. F. KEABLE. *Gas World* 69, 183-4(1918); *Gas J.* 144, 77-9, 120-1(1918).—The plant described is the "K. and A." Smith's modification. The arrangement, design of plant, and method of operation are given in detail. Some working results are: sp. gr. of blue water gas 0.6, S content 113 grains per 100 cu. ft., cal. value 331 B. t. u., fuel consumption 29.8 lbs. per 1000 cu. ft. of blue water gas, benzene recovered 1.79 gals. per ton of coal. With this plant clinkering troubles are reduced, heat is given up by the blue water gas to

the cool coke, the gas leaves the plant freed from dust, and the content of  $\text{CO}_2$  is low. K. is convinced that a combination of horizontal retorts worked in conjunction with blue water gas, would prove the solution not only of cheaper gas and the conservation of coal but would give to the gas-consuming public a gas in every way suitable for modern requirements.

J. L. WILEY.

**Reinforced concrete purifiers at Tottenham.** A. E. BROADBERRY. *Gas J.* 144, 657(1918); cf. *Ibid* 138, 485.—A novel use of reinforced concrete for overhead purifiers. The concrete was treated with "Ironite" to make it gas-tight. The purifiers have been in use for 1 yr. No defects have developed and their operation is satisfactory, particularly since their cost was barely one-half of what it would have been if cast-iron had been used.

J. L. WILEY.

**Gas economies with special regard to carbonization and the treatment and disposal of residual products.** JAMES DICKSON. *Gas J.* 144, 187-9(1918).—This paper contains some practical comments on steaming of retorts and the precautions to be taken. By steaming vertical retorts of the continuous-intermittent type a yield of 16,193 cu. ft. of gas per ton of coal was obtained with an av. cal. value of 450-460 B. t. u. after oil washing. An av. % compn. showed  $\text{H}_2$  50.8,  $\text{CH}_4$  19.7, unsatd. hydrocarbons 2.2,  $\text{CO}$  14.1,  $\text{O}_2$  0.8,  $\text{CO}_2$  5.6,  $\text{N}_2$  6.8. The coal passes the "sticky" stage sooner and the yield per unit of plant is increased by the last remains of volatile matter being pushed out by the action of the steam. Practical comments are made on recent progress in coke manuf., boiler firing, and fuel economy, intensive production of  $\text{NH}_3$  by steaming, tar dehydration and benzene recovery.

J. L. WILEY.

**Results with and without steaming in continuous vertical retorts compared.** JOHN WEST. *Gas World* 69, 180(1918).—Respective results with and without steaming in Glover-West retorts at Uddingston Gas Works. Number retorts required to make 350,000 cu. ft. daily 4-10, gas per ton of coal 25,273-11,450 cu. ft., av. cal. value (stripped) 460 B. t. u., (not stripped) 560 B. t. u., coke sold per ton 8.53-9.25 cwt., tar and light oils per ton 24.6-14.5 gals.,  $(\text{NH}_4)_2\text{SO}_4$  52.86-30.5 lbs.

J. L. WILEY.

**Use of gas coal in water-gas sets presents disadvantages, but shows money saving in cost of make.** A. C. HOWARD. *Am. Gas Eng. J.* 109, 385-6(1918).—The Union Gas and Elec. Co., Bloomington, Ill., has been using for several months Indiana gas coal instead of coke for making water gas. There is indicated a considerable saving both in gas oil and in fuel, the total net saving per day for May being \$71.21 with an av. production of gas of 571,000 cu. ft. The chief disadvantages are a reduction to about 70% of the set capacity on good coke, the escape of a yellowish gas from the stack when blasting, the presence of gas on the operating floor, and burning gases at the coaling door when charging the generator. There were used 2.68 gals. of oil per 1000 cu. ft. of 572 B. t. u. gas produced. The operating cycle and general method of handling are not sufficiently different from ordinary coke operation to warrant discussion. The set is operated on 100% coal except that when starting coke is used.

J. L. WILEY.

**Effect of direct and indirect ammonia recovery upon other by-products, and some of the advantages to be made use of.** THOMAS B. SMITH. *Gas World* 70, (Coking and By-products Sec.) No. 1798, 12-4(1919); *Gas J.* 144, 661-2(1918).—The direct system is as yet the nearest step the coke-oven industry has taken toward the idealist's "fractionation of the hydrocarbons in the tar main." The tar is brought down at a temp. considerably above the dew-point of many of the hydrocarbons, which in consequence are dephlegmated free from the heavier constituents. But many of the possible advantages of this have been neglected, with the result that a good deal of work is unnecessarily imposed on the benzene rectification plant. The clean-cut in the condensation of the hydrocarbons naturally has a drastic effect upon the tar, the viscosity of

which is so great that in cold weather it is more like pitch; and where it has to be loaded into tanks there has to be a constant addition of thick oil from the benzene plants. Upon distn. only a negligible quantity of benzene and pyridine bases are obtained. The yield of phenolic compds. is also very poor. The pink coloration of  $(\text{NH}_4)_2\text{SO}_4$  is due to the cyanogen compds. and is peculiar to the direct process. The  $\text{NH}_4\text{CNS}$  formed by the water vapor,  $\text{NH}_3$  and  $\text{CS}_2$  in the gas forms in the saturator a compd. with iron, probably an impurity in the acid. An apparently white salt is obtained which, however, colors quickly on exposure to the air, due to the presence of slight traces of a blood-red  $\text{Fe}(\text{CNS})_3$ . The coloration is intensified if more ferric salt is added, this salt being gradually formed from the oxidation of the slight traces of  $\text{FeSO}_4$  always present in com.  $(\text{NH}_4)_2\text{SO}_4$ . Naphthalene trouble on the cooling plant with the direct process is very great, but by using a suitable preventative the condenser can be kept clean for as long a period as with the indirect process. In regard to benzene recovery, S. thinks that the Simon-Carves plan is unique in its method of raising the strength of the benzene while completely stripping the oil. Complete denudation is effected in the still, the light vapors being dephlegmated from the creosote, naphthalene, cresols, heavy naphthas, and the bulk of the condensed water, in a primary condenser, the outlet temp. of which is maintained at about  $92^\circ$ . The intermediate substances are led to a sepg. tank, and will be found to include from 7 to 10% of phenolic compds. It is considerable of a com. proposition also now to recover cyanogen from coke-oven gas. The Bueb process appears to be the most effective. This involves the scrubbing of the gas before it enters the  $\text{NH}_3$  saturator with a 25-30% soln. of  $\text{FeSO}_4$ , which combines with the cyanogen,  $\text{H}_2\text{S}$  and  $\text{NH}_3$ , the ultimate products being the double ferrocyanide of  $\text{NH}_3$  and  $\text{Fe}$ , and a proportion of  $(\text{NH}_4)_2\text{SO}_4$ . By recovering the cyanogen after passing through the saturators, ultimate products can be obtained of greater purity than those obtained in the indirect process.

J. L. WILEY.

**Fine coal washing for coke in South Wales.** ANON. *Gas World* 69 (Coking and By-products Sec.), No. 1785, 16(1918).—In connection with the colliery and by-product coking works of the Glamorgan Coal Co., at Llwynypia, a Draper installation for the washing of fine coal has been in use successfully for some months. The plant deals with 30 tons of material per hr., consisting of slurry from the main washery, dust from the coal screens, and sweepings from other sources. After washing this material goes to the coke ovens with a relatively low ash content, and with not more than 8% moisture, and gives an excellent coke with not more than 7.5% total ash. The system is also applicable to washing of sizes up to nuts. The plant is described in detail by aid of diagrams.

J. L. WILEY.

**Carbonization of wood in the Stockholm gas works.** ANON. *Gas Age* 43, 74-6 (1919).—In order to det. whether or not wood could be used as a substitute for coal for gas-making, tests were carried out in inclined retorts. Bundles of wood in 3-ft. lengths were charged into the upper half of the retort, the lower half being left full of red-hot charcoal for the purpose of reducing the high content of  $\text{CO}_2$  to  $\text{CO}$ , and a small amt. of coal was used in the upper end to cause graphitization in the retorts for the purpose of sealing them and also to furnish  $\text{NH}_3$  for neutralizing the acetic acid in the wood gas. Each charge consisted approx. of 110 lbs. of wood, and 11 lbs. of coal charged about every 2-3 hrs. The temp. of the retort was about  $1200^\circ$ . Tabulated results show that the gas recovery with moist wood as well as its cal. value decreases with increasing % of moisture whereas with dry wood the contrary is true although not uniformly due probably to secondary reactions. Without a reducing charge the gas recovery diminishes by almost one-half. The sp. gr. of the gas is high, due to the high content of  $\text{CO}_2$  which decreases with the decrease in moisture. Three distns. were made with a reducing charge with moisture contents of, resp., 16, 25, and 35%, and one without with a mois-

ture content of 19%. The % compn. of the gas produced in each distn., resp., are: CO<sub>2</sub> 11.4, 14.2, 16-15.8; heavy hydrocarbons 1.9, 1.2, 1.8-2.1; O<sub>2</sub> 1.8, 2.1, 1.3-1.3; CO 21.9, 26.1, 21.8-23.6; CH<sub>4</sub> 14.9, 8.2, 9.1-14.5; H<sub>2</sub> 46.5, 44.5, 47.1-39.2; N<sub>2</sub> 1.6, 3.7, 2.9-3.5. The charcoal production from dry wood was for each distn., resp., 23, 18, 16-19%. In firing tests it was found that the mixt. of charcoal and coke could be used for heating the retorts provided the air supply was properly adjusted.

J. L. WILEY.

**Modernization of plant.** H. C. WIDLAK. *Gas J.* 144, 171-3, 232-4, 301-2 (1918).—Experiences in altering retort-house machinery without holding up operations.

J. L. WILEY.

**Koppers chamber ovens for coal-gas manufacture.** K. BUNTE AND E. TERRES. *J. Gasbel.* 61, 433-6, 445-50 (1918); *Gas J.* 144, 661 (1918).—A series of efficiency tests carried out in 1912 at the Vienna-Leopoldau Gas Works on the Koppers system of chamber ovens. The plant consisted of 72 chamber ovens in ranges of 9, 5 of which were working during the test. \* Each chamber was 10.3 m. long by 540 mm. broad at the discharging end, tapering to 480 mm. at the charging end. The cold producer gas and secondary air were heated by the waste gas in 4 regenerators built under each oven. The producer gas came from an external Kerpely-Marischka plant consisting of 12 producers, 5 of which were at work. The water-jacket steam boilers on these producers generated the necessary steam. The vol. of producer gas made was calcd. on a carbon balance sheet obtained from analyses. It was shown by one test that 11.17 kg. of coke were burned in the producer during the carbonization of 100 kg. of coal and that 663 cal. had to be supplied as producer gas to the ovens to carbonize 1 kg. of coal. The percentage compn. of the producer gas was: CO<sub>2</sub> 3.65, O<sub>2</sub> 0.2, CO 29.12, H<sub>2</sub> 9.88, CH<sub>4</sub> 0.2, N<sub>2</sub> 56.95. The thermal balance sheet showed that the heat doing useful work in the ovens amounted to 71.1% of the heat of combustion of the coke used in the producers, whereas the producer gas itself contained 81.6% of the heat of combustion of the coke used in its production. The difference represents the heat lost in the waste gases and by radiation.

J. L. WILEY.

**Inclined chamber ovens at Auburn Junction.** C. E. REESE AND F. W. SEYMOUR. *Gas Age* 43, 80-3 (1919).—A description of installations of Russell Engineering Co.'s inclined slot ovens at Auburn Junction, Ind., and Battle Creek, Mich. The ovens are each 19.5 ft. long and built of silica materials. Producer gas is generated for heating the retorts, and recuperative heating is employed. Provision is also made for steaming under the grates with the object of preventing clinkers and reducing fuel consumption. Operation results for the month of March in 1 setting of 3 slots at Auburn Junction show an av. of 173.4 thousand cu. ft. of gas daily, 5.81 cu. ft. of gas per lb. of coal carbonized, 6690 lbs. of coke generator fuel used per day, 467 lbs. of generator fuel per ton of coal carbonized, 40 lbs. of generator fuel per 1000 cu. ft. of gas made, 5.7 ovens charged per day, and 5200 lbs. of coal per charge. This installation resembles the coke oven in that the charges are larger and the coking period is longer than in the usual gas bench practice. At Battle Creek tests of the raw gas indicate yields of 5.5 lbs. NH<sub>3</sub> and 11 gals. tar per ton of coal.

J. L. WILEY.

**New coke-fired German gas producer.** ANON. *Stahl u. Eisen*, March 7, 1918; *Iron Age* 103, 180-1 (1919).—A type of tapping gas producer similar in design to a small blast furnace with a vertical shaft and narrowed hearth, charging hopper and cone, and using coke exclusively. It has been in operation for 2 yrs. The producer is arranged with tapholes because the ash of the coke is changed into slag by means of charges of mixer slag or basic open-hearth slag, or mixts. of the two. The iron is reduced and obtained as a pig-iron high in Mn and P. No steam is used nor is there any heating of the hearth. The blast heated to 55-70° has a pressure of 9.1 oz. per sq. in. It is

distributed from the bustle pipe to 6 water-cooled tuyères. The gas produced known as dry-gas has the following analysis:  $\text{CO}_2$  0.30-0.70%,  $\text{CO}$  33-33.5%,  $\text{CH}_4$  1.2-1.3%,  $\text{H}_2$  0.10%, S 0.122 grains per cu. ft., moisture 5.24 grains per cu. ft., dust 0.73 grains per cu. ft., sp. wt. 0.91-0.94, cal. value 127 B. t. u., temp. attained by burning  $85^\circ$  higher than ordinary coal producer gas. The gas is practically free from tar, there is no loss of C through the formation of tar, and all the C in the coke is gasified. With an av. C content of 86-88%, each kg. of coke gives 4.8-5 cu. m. of gas, whereas in usual producer practice 1 kg. of coke gives 4.4 cu. m. Except for the hearth lining which needs renewal about every 13 months, the producer requires little repairs.

J. L. WILKY.

**Refractory materials in gas-works, from a user's point of view.** JNO. P. LEATHER. *Trans. Eng. Ceram. Soc.* 17, 246-7(1918).—See C. A. 12, 1824. C. H. KERR.

**Corrosion of dry gas meters.** J. G. TAPLAY. *Gas World* 69, 230-1(1918); *Gas J.* 144, 359-62(1918).—An examn. of the liquor found in a meter showed it to consist of (1) an oily part containing 94.5% unsatd. hydrocarbons together with resins and naphthalene, 5% pyridine bases and 0.5% paraffins, (2) an aq. part containing pyridine bases,  $\text{FeSO}_4$  and  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{Fe}(\text{CNS})_3$ ,  $\text{NH}_4\text{CNS}$ ,  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  and leather residue, (3) a solid part containing 91% leather substance, 8.5%  $\text{Fe}_2\text{O}_3$ ,  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{Sn}(\text{SO}_4)_2$ ,  $\text{ZnSO}_4$ , and 0.5% free S. Further investigation recorded the effects of the solns. of salts on tinned sheet-iron, and on undressed and dressed meter leathers, left in contact for 4 hrs. **Tinned Sheet Iron:**  $(\text{NH}_4)_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  appear to be more active than  $\text{NH}_4\text{CNS}$ . Only the 2 latter salts dissolve the  $\text{Fe}_2\text{O}_3$  formed and liberate the  $\text{NH}_3$  which can combine with a further quantity of  $\text{CS}_2$ .  $(\text{NH}_4)_2\text{SO}_4$  appears to produce more perforation of the sheet-iron than do other  $\text{NH}_4$  salts, probably because of the greater galvanic action set up. With aq. soln. of pyridine bases, no corrosion is likely to occur. This applies also to a soln. of  $\text{Fe}(\text{CNS})_3$ . Moist  $\text{SO}_2$  is very destructive both toward sheet-iron and the brass parts of the meter, converting them into sulfites and sulfates. **Undressed Leather:** Solns. of  $\text{NH}_4\text{CNS}$ ,  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ , pyridine bases,  $\text{Fe}(\text{CNS})_3$ , remove tannin and lime, and the 3 former remove  $\text{Fe}_2\text{O}_3$  from leather. With regard to the sediments containing leather substance, solns. of  $\text{NH}_4\text{CNS}$ ,  $(\text{NH}_4)_2\text{SO}_4$ , pyridine bases and  $\text{Fe}(\text{CNS})_3$  cause this sediment to be produced, while  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  does not. A mixed soln. of pyridine bases and  $\text{NH}_4\text{CNS}$  produced more sediment than each of these alone. Moist  $\text{SO}_2$  causes the rotting of leather. The mixed liquor produced by the action of  $\text{CS}_2$  with  $\text{NH}_3$  also contained a leather substance; the filtered liquor contained tannin,  $\text{Fe}_2\text{O}_3$ , lime and soluble leather substance. **Dressed Leather:** Solns. of  $\text{NH}_4\text{CNS}$ ,  $(\text{NH}_4)_2\text{SO}_4$ ,  $(\text{NH}_4)_2\text{S}_2\text{O}_8$ , pyridine bases, and  $\text{Fe}(\text{CNS})_3$  remove the oil-dressing from leather.  $(\text{NH}_4)_2\text{SO}_4$  removes the least, and  $\text{Fe}(\text{CNS})_3$  the most. After removal of the oil-dressing, solns. of  $\text{NH}_4\text{CNS}$ , pyridine bases, and  $\text{Fe}(\text{CNS})_3$  contained a sediment of leather substance. Solns. of  $(\text{NH}_4)_2\text{SO}_4$  and  $(\text{NH}_4)_2\text{S}_2\text{O}_8$  contained no sediment. All the filtered liquors except  $(\text{NH}_4)_2\text{SO}_4$  contained tannin,  $\text{Fe}_2\text{O}_3$  and lime derived from leather. Benzene was found to retard the action of a moist mixt. of  $\text{CS}_2$  and  $\text{NH}_3$  upon meter materials. In many meters which failed to register correctly the fault was attributed to the presence of a resinous material on the valve. A cure for corrosion is suggested by reference to meters which had become coated with paraffin due to the spraying of the gas with paraffin oil for naphthalene prevention. T. remarks that there seemed to be no doubt that this oil had preserved the metal parts and the leathers from corrosive action, for when the meters were opened after service of from 5-14 yrs. the metal parts and leather were in an excellent state of preservation. This paraffin oil spray also kept the valves lubricated and the meters in proper working condition. The method has been permanently adopted at the Hagerston Meter Works for preserving the meters.

J. L. WILKY.



**Unaccounted for gas.** B. R. PARKINSON. *Gas World* 69, 228-30(1918); *Gas J.* 144, 362-9(1918).—Gas losses are due to 3 causes: (1) Corrections for temp., condensation and pressure, 0.75%; (2) leakage, 1%; (3) measurement, 5% with an added 0.25% for fast station meters. P. discusses also the practical application of spraying meters for preserving them from corrosion. The immediate effect is to clean the slide valves, ultimately to soften the leathers and restore the mechanism to a normal working. The app. used is the same as for spraying paint. One gal. of oil will spray 100 meters. The oil used is the same as for gas-making. A heavy mineral oil is equally effective, or hot paraffin vapor may be used. A considerable saving is possible in meter repairs and gas leakage.

J. L. WILEY.

**Coal tar as a key industry.** ALFRED BURTON. *Can. Chem. J.* 3, 58-9(1919).

E. H.

**Plant of the Seaboard By-product Coke Company.** D. MACARTHUR. *Gas Age* 43, 1-6, 69-73(1919).—Description of a Koppers installation which is said to represent the latest developments in coke oven practice. The article is illustrated. Seventy-two % of the by-product ovens in the country are Koppers ovens, capable of carbonizing 33 million tons of coal per yr. and of producing 24.75 million tons of coke. The products of this plant are coke, gas, tar,  $(\text{NH}_4)_2\text{SO}_4$ , benzene, and naphthalene. The installation consists of 165 ovens or 3 batteries of 55 ovens each. One battery is the Koppers standard horizontal cross-regenerative by-product coke oven type, the other 2 the horizontal cross-regenerative combination type. The ovens are designed for 15-hr. coking time, each having a capacity of 12.5 tons, and being 37.5 ft. long by 10 ft. high by 18.25 in. av. width. Silica brick are used throughout for the oven walls and heating flues. With 165 ovens carbonizing on 16.5 hrs. coking time, there is a daily capacity of 3,000 tons of coal, yielding 2,200 tons of coke, 16.5 million cu. ft of surplus gas of 610 B. t. u. quality, 75,000 lbs. of  $(\text{NH}_4)_2\text{SO}_4$ , 24,000 gals. tar and 10,000 gals. light oil. The company is producing a motor fuel called B-zol. It is said to yield about 20% more power and 15-25% more mileage than gasoline. Since the fuel has been introduced in the market, the demand for it promises to exceed greatly the supply. The plant is equipped to make 350,000 gals. of B-zol per month.

J. L. WILEY.

Hydraulic separation as applied to the recovery of fine coals, shales and clays (DRAPER) 1. Corrosive action of flue dust on fire-bricks (MELLOR) 19. Photometric apparatus (TROTTER) 1.

**GUIEU, PIERRE:** *La tourbe, Prospection, Extraction, Traitement, Utilisation.* Paris: Garnier frères, 6 rue des Sts-Pères. 220 pp. 3 francs. For review see *Rev. sci.* 56, 606(1918).

**Artificial fuel.** L. LE W. HAMON. *Brit.* 121,102, Aug. 20, 1918. Lignite, peat, sod, leaf mold, or shale, or two or more of these raw carbonaceous materials are mixed with cellulose material, such as sawdust, silica, alkali, and tar or pitch, or residues from tar or pitch, or residues from the distn. of oils, and the mixt. is molded into blocks. Other carbonaceous materials, such as graphite, anthracite, or coal dust, coke breeze, or culm and mineral substances, such as Fe and Mn ores, may be added. A smokeless fuel can be obtained by coking the blocks in the usual way in retorts.

**Briquets.** C. H. SMITH. *Brit.* 120,585, Aug. 29, 1917. Briquets are made from mixts. of raw coals, raw coal and coke, or raw coals and a hydrocarbon binder such as coal-tar pitch, asphalt pitch, coal-tar or petroleum oils, the mixt. being such that the volatile matter contained therein is between 11 and 17%. The mixt. is made into a

mash with  $H_2O$ , or by the aid of the binder, the whole being well crushed. The mixt. is then molded into briquets, and these are carbonized in a chamber which is maintained at a temp. between  $1400$  and  $2000^\circ F.$ —preferably at about  $1850^\circ F.$ —the by-products being collected. It is stated that the briquet produced is hard and porous, burns with a non-smoky flame, and has a volatile content of about 2.5%. Cf. 111,285 (C. A. 12, 627.)

**Motor spirit.** J. PENHALE. Brit. 120,792, Dec. 3, 1917. A motor spirit consists of a satd. soln. of  $C_2H_2$  in alc. with the addition of acrolein as a denaturant.

**Treating gases.** W. G. LEAMON. Brit. 120,554, Sept. 25, 1918. In a process of eliminating  $H_2S$  from natural gas, coke-oven gas, producer gas, illuminating gas, or the like, the gas, preheated to about  $300^\circ$ , is supplied with a small quantity of air sufficient to oxidize the H of the impurity but not necessarily the S, and is passed over heated pumice, fire-brick, broken pottery, or the like, wherein the oxidation occurs. Proceeding immediately to cold scrubbers or absorbs the S vapor is condensed or fixed. The pumice, etc., may carry metal catalysts as Pt, Ni, or the like. The operation may be conducted with the gas at delivery or enhanced pressure. The preheater comprizes a folded Fe pipe in a jacket or furnace, the oxidizer comprizes a folded Fe pipe in a jacket or furnace and the oxidizer comprizes an Fe U-tube fitted with the pumice in a furnace.

**Coke.** A. McD. DUCKHAM. U. S. 1,289,045, Dec. 24. The pat. relates to a method of heating coal in vertical retorts to effect coking.

**Cooling coke, etc.** B. E. D. KILBURN. Brit. 120,329, Mar. 7, 1918. Hot residues from distn. processes, such as coke, are cooled by the repeated circulation through them of a body of air, the O of which is taken up in the early stages of the process. The app. is specified.

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## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

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F. M. ROGERS.

**The Russian petroleum industry and its prospects.** D. GHAMBASHIDZE. *J. Inst. Petroleum Tech.* 4, 158-88(1918).—A statistical review. F. W. SMITHER.

**The Scottish mineral oil industry.** ANON. *J. Soc. Chem. Ind.* 37, 467-8R(1918). E. H.

**Gasoline plants and their operation.** G. A. BURRELL. *Oil & Gas J.* 17, No. 36, 54-6(1919).—The first essential is clean gas-gathering lines with care observed in having all joints tight. Air which leaks into the system not only may be dangerous but also makes a greater pressure necessary to remove gasoline. The most effective pressure and temp. for each particular plant should be detd. by test. Cooling water should always be dropped in thin sheets to get best radiation and evapn. Good results are obtained using expansion engines, and artificial cooling is coming into greater favor. Direct cooling of the residual gases with brine holds possibilities. Mineral seal oil is still considered best for absorption and vertical absorbers with minimum height of 35 ft. are better than horizontal. For gas containing up to 1 gal. per 1000 cu. ft. the absorption plant is most effective, but compression may be used above that point or a combination of both methods. The gasoline content of inlet and residual gas should be detd. regularly, and meters also checked up occasionally. The use of vacuum pumps is not recommended unless exptl. data have shown they increase the yield. The simple rule for blending is as follows: "blend as soon after making, and with as little agitation and exposure to air as possible, using proportions as detd. by experimentation."

R. R. MATTHEWS.

**Physical tests of gasoline.** J. F. NEWTON AND F. N. WILLIAMS. *Petroleum Age* 6, No. 2, 41-4 (1919).—Distn. is the most important as it indicates clearly the quality of the gasoline. The initial b. p. is the temp. at which the first drop of condensate falls from the condenser. The final b. p. is the highest temp. reached in distg. a sample to dryness. Tagliabue's app. is used for gasoline distn. and 5% temp. readings are made. The "doctor test" (i. e., test for S compds.) is next in importance to distn. The gasoline is thoroughly shaken with a soln. of sodium plumbite and a small quantity of flowers of S is added. If neither the gasoline or S is discolored the "doctor test" is satisfactory. The color is now generally taken with some type of colorimeter and not in a 4-oz. bottle. D., odor, % water, and foreign matter, chill test and calorific value are also taken up, but are minor considerations. With casing-head gasoline the detn. of vapor pressure is of importance because of shipping restrictions. The standard method of taking vapor pressure is shown. Gasoline specifications of U. S. Government for motor gasoline are as follows: Initial b. p. not over 140° F., 20% off at 221° F., 45% off at 275° F., 90% off at 356° F., and final b. p. not over 428° F. Domestic aviation must have 5% distd. between 122° F. and 157° F., 50% off at 221° F., 90% off at 311° F., and 96% off at 347° F. This means a gasoline having a final b. p. approx. 370° F. Export aviation gasoline must have 65% off at 212° F., 87% off at 240° F., and final b. p. not over 302° F.

R. R. MATTHEWS.

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#### Transformer oils (ESCHHOLZ, PHILIP) 4.

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HAGER, DORSEY: *Practical Oil Geology*. 3rd Ed. New York: McGraw-Hill Book Co., Inc. 243 pp. \$2.50. For review see *Mining Sci. Press* 118, 234 (1919); cf. C. A. 9, 1891; 11, 3117.

**Distilling petroleum oils.** L. O. SHERMAN. U. S. 1,288,711, Dec. 24. In distg. petroleum oils to obtain products of low b. p., the oil is heated under pressure to vaporize a portion of it, the higher boiling portions of the distillate are condensed and this condensed portion of the distillate is mixed with a portion of oil from the still and heated under a pressure above that of the initial vaporization to obtain low-boiling products. The pat. illustrates and describes an app. for carrying out this procedure.

**Apparatus for distilling and refining petroleum oils.** H. C. LEEFE. U. S. 1,288,934, Dec. 24.

**Distilling hydrocarbons, etc.** C. TURNER. Brit. 120,854, Nov. 23, 1917. In the fractional or destructive distn. of hydrocarbon oils or other liquids, the pressure in the still is raised and lowered alternately. The still is closed to raise the pressure, and is opened to lower the pressure rapidly solely by expansion of the vapors. The operation is effected without intermittent cooling, except such as may occur during the lowering of the pressure. In distg. hydrocarbon oil, pressure steam is blown into the oil until the pressure reaches 5 lbs. per sq. in. The vapor outlet is then opened until the pressure falls to 2 lbs. per sq. in. whereupon the vapor outlet is closed and steam is again admitted. The operation is continued until the steam, which is of 20 lb. pressure, no longer effects distn.; after this stage, superheated steam is used.

**Vaporizing oils.** C. B. FORWARD. Brit. 120,626, Nov. 15, 1917. Oils are vaporized or gasified by injecting oil vapor and steam into one of three tubes which are connected together and are heated in a furnace, the tubes being surrounded by outer tubes which contain superheated steam. The vaporizing tubes are connected by U-bends arranged in an air-tight manner, and the outer and inner tubes are connected together in a manner which permits of unequal expansion of the tubes without loss of air-tightness in the connection.

**Purifying acetates, etc.** SOCIÉTÉ E. BARBET ET FILS ET CIE. Brit. 120,558, Oct. 9, 1918. Crude aq. acetates obtained by wood distn. are purified from tar by treating them with an org. solvent for tar which is insol. or only slightly sol. in  $H_2O$ . The preferred solvent is cresol; benzene hydrocarbons, carbolic oils, naphthols, petroleum spirit, turpentine spirit, Me acetate, etc., also may be used. Using the app. specified, a tower packed with porcelain balls, quartz, broken glass, coke, etc., is supplied at the bottom with cresol from a vessel and at the top with crude acetate soln. from a vessel. The purified acetate soln. is withdrawn from the bottom of the tower and the dissolved tar from the top. The tar soln. is distd. to recover the solvent of the tar. The process can be applied to remove tar from other liquids, e. g., crude acetone or  $NH_4OH$ .

**Distilling wood.** SOCIÉTÉ E. BARBET ET FILS ET CIE. Brit. 120,560, Oct. 11, 1918. App. adapted for continuous working for treating the vapors, generated in distg. wood to sep. "methylene" (presumably  $CH_2OH$ ) and to form a soln. of Na or Ca acetate free from tar. Constructional details and operation are specified.

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### 23. CELLULOSE AND PAPER.

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A. D. LITTLE.

**Cellulose esters.** A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9501-8(1918).—A review of the work done on the nature of the reactions in the formation of nitrocellulose and cellulose acetate. D. confirms the statements of Mosenthal that materials of the same chem. compn., having different physical states or construction, produce esters with widely varying properties. JOHN B. TUTTLE.

**The Webb paper tester, a new instrument for testing corrugated fiber boards.** J. D. MALCOLMSON. *J. Ind. Eng. Chem.* 11, 133-8(1919).—The Webb tester consists essentially of a steel plunger, 0.1 in. in diam., actuated by a helical steel spring which may be compressed by means of a hand wheel operating through suitable gearing, and the deflection of the spring indicated by a dial calibrated to read in pounds per sq. in. Owing to the small test area required, it is possible to test the component parts of corrugated board, and the strength value of the board is more nearly indicated than is possible with the Mullen tester. In addition to the puncture test, the Webb machine may be used for tensile, elongation, and compression tests. R. B. ROX.

**Paper textiles.** LILLIAN B. STORMS. Iowa State College. *J. Home Econ.* 10, 451-6(1918).—A summary of the development of paper textiles. A bibliography is appended. HELEN N. ELLIOTT.

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**Obtaining products by destructive distillation (application to soda cellulose waste liquors)** (Brit. pat. 120,724) 18.

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**Fermenting sulfite liquors.** R. H. MCKEE. Brit. 120,520, May 15, 1918. To produce alc. from sulfite liquors containing fermentable sugars they are treated with yeast in the presence of excess  $O$ . The amt. of free  $SO_2$  in the liquor is preferably reduced to 0.35 g. per liter by boiling, blowing air through the soln. while heated, or other methods. The liquor is then brought to a temp. of  $27-8^\circ$  and yeast is added. Air is blown through the liquor while fermentation is proceeding. The liquid is then distd. to sep. the alc., alkali being added to fix the  $SO_2$ . The air used in the process is washed in unfermented liquor to recover alc. carried off by it.

**Obtaining pulp, etc., from sea tang.** V. FRYDENBERG. Brit. 120,761, Nov. 19, 1917. In prepg. sea tang, particularly *Zostera marina*, for paper pulp or for strength-

ening plaster, stucco, and the like, the whole mass, which may be bleached with Cl, chloride of lime, or the like, is dried in the air or artificially and then comminuted by ordinary crushing, rubbing, or carding processes to the required degree of fineness.

**Stencil-sheet.** J. A. AMBLER. U. S. 1,288,792, Dec. 24. A stencil-sheet is prep'd. by passing an open-texture porous paper through a soln. of gelatin and CaCl<sub>2</sub> and then through a soln. of glycerol. The sheet is tough and pliable.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**Recommendations of the tariff commission regarding dyestuffs.** GRINNELL JONES. *Color Trade J.* 4, 27-30(1919).—Address before Am. Inst. Chem. Eng. Cf. C. A. 12, 767. L. A. OLNEY.

**British scheme for state aid to dye industry.** ANON. *Board of Trade J. (Brit.)* Nov., 1918; *Color Trade J.* 4, 44-6(1919).—The object is to insure that the trade requirements of the British Empire dependent upon a supply of dyes are met within a reasonable period to an extent sufficient to make them independent of German dyestuffs, but not to assist financially the formation or development of any dye-making business in the interests of the business as such. Two kinds of assistance are proposed: (A) Loans at commercial rate of interest especially for the development of dyes which are reasonably necessary for dye users, but which are not manuf'd. at all or in any sufficient quantity. (B) Grants (1) in aid of the cost of plant and building provided, mainly for the purpose described under A, and (2) in aid of research. Such grants are not to exceed 40% of extension of lab: buildings and equipment and 40% of annual maintenance. The whole supervision and administration of these loans and grants are to be under the British Board of Trade. L. A. OLNEY.

**Dyestuff industry in France.** ANON. *Color Trade J.* 4, 47(1919).—From U. S. Consular Report. France is following the example of America and England in endeavoring to create a national chem. industry to combat the monopoly which Germany has controlled. La Compagnie National des Matieres Colorantes et des Products Chimiques with a capital of 40,000,000 francs was organized with this object in view.

L. A. OLNEY.

**The Brazilian market for aniline dyes.** ANON. *Color Trade J.* 4, 36-8(1919).—Statistics as to imports of dyes by this country, import duties, German sales systems, and the methods available for distributing dyes. L. A. OLNEY.

**Influence of dyeing and finishing processes on woven fabrics.** EBER MIDGLEY. *J. Soc. Dyers Colourists* 35, 20-3(1919).—During the dyeing and finishing processes all woven fabrics alter to some extent in appearance, handle, strength, and elasticity. The amt. of alteration is dependent on 4 factors: (1) the type and quality of the raw material or materials employed, (2) the type and structure of the warp and filling threads, (3) the structure and setting of the cloth in the loom, (4) the particular processes and degree of treatment in each to which the fabric is subjected during the dyeing and finishing. A series of tests recorded in diagrammatic form indicates that crabbing, scouring and permanent finishing attack the wool fiber to some extent, and are responsible for an appreciable amt. of tendering. While the limit has been reached in respect to the types of raw materials and the structures of yarns employed in the manuf. of textiles, there is no limitation in the mechanical treatment and manipulation, nor the chem. treatment of the materials to provide them with new and improved properties. The most serious irregularity developing during dyeing and finishing and the most difficult to account for is known as "crimps." Uneven shrinkage being the cause of

the defect indicates that it arises from an absence of uniformity in either materials or treatment in some process from fiber to finished cloth. L. A. OLNEY.

**Notes on cleaning and dyeing with volatile solvents.** H. HEGY. *J. Soc. Dyers Colourists* 35, 12-8(1919).—The use of solvent liquids in the so-called "dry," "French" or "chemical" cleansing enables the operation to be more effectively done and with far less damage than would result from use of water. The commonest solvents are petroleum, benzene and solvent naphtha. Non-inflammable solvents like  $\text{CCl}_4$  and  $\text{C}_2\text{HCl}_3$  have been suggested, but cannot be recommended if exposed to the air, as their vapors are injurious to work people and when purified by distn. they are likely to decompose if in contact with water and metals at high temps. They are also more costly. Water is slightly sol. in these solvents, and this soly. increases with temp. Such dissolved water will sep. upon cold surfaces during the cooling, and for this reason all articles must be dry before coming in contact with the solvent. Solvents containing oils and fatty acids dissolve more  $\text{H}_2\text{O}$  than non-greasy solns. "Benzine soap" dissolved in the solvent makes it capable of taking up much more  $\text{H}_2\text{O}$  and this is one of the properties which makes it valuable in dry cleansing. The  $\text{H}_2\text{O}$  contained in the volatile soln. may hold certain dyes, sol. hydroxides, water-sol. gums, and various disinfectants and the solvent acts as an inert vehicle for conveying a small amt. of very strong soln. of the substance to the material immersed in the mixed liquid. For each pound of goods cleansed something like 5 or 6 gals. of clean spirit is required but much of that used is reclaimed. The general principles involved in all systems are discussed and then detail is given in regard to the "Barbe" system, which uses a closed revolving barrel, and "Smith's" system, which uses a machine consisting of an outer casing of Fe containing the solvents and an inner cage of steel with a periphery of perforated steel plates which is carried on a strong steel shaft. The cage may be revolved in the solvent within the outer casing, or when the solvent has been withdrawn it may be revolved more rapidly and thus act as a hydro-extractor. The paper closes with a discussion of "Dry Dyeing." Cf. Fort, C. A. 13, 379. L. A. OLNEY.

**Carbonizing wool.** ANON. *Chem. Eng. Mining Rev.* 10, 23(1918).—The process consists in steeping the wool in  $\text{H}_2\text{SO}_4$ , then dry heating it to about  $100^\circ$ , after which it is passed through a burr-crushing machine. The acid is then neutralized and the wool washed. Care should be taken that the acid is not too concd., that it is applied evenly to the wool, that the temp. is not too high, or the time of treatment too long. During the heating there must be no condensation, as acid would concentrate in the moist part and injure the fiber. Neither concns., temps., nor times are stated. As about 200,000 bales of burry wool are produced yearly in Australia, a standardized process for removing the burrs is apparently needed. L. W. RIGGS.

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Quinoneimide dyes (KEHRMANN, SANDOZ) 10. Medieval pigments (LAURIE) 26.

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FORD AND LLOYD: **The Chemistry of Dyestuffs.** London: Cambridge University Press. C. F. Clay, Fetter Lane, E. C. 4. 311 pp. 7s. 6d. For review see *Rev. sci.* 56, 557(1918).

GREEN, ARTHUR G.: **The Analysis of Dyestuffs.** 2nd Ed. London: Charles Griffin & Co., Ltd., Exeter St., Strand, W. C. 144 pp. For review see *Rev. sci.* 56, 607(1918).

PERKIN, A. G. AND EVEREST, A. E.: **Natural Organic Colouring Matters.** London: Longmans, Green & Co. 28s. net. For review see *Chem. Trade J.* 64, 97 (1919).

**Dyes; dyeing.** A. M. HART. Brit. 120,588, Aug. 13, 1917. Peat is treated with  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$ , either in admixt. or successively; the resulting acid liquid is sepd. from the fibrous residue and is used as a dye base. The liquid may be evapd. to dryness, or may be neutralized by an alk. salt and the neutral soln. crystd. The bulk of the Fe present in the acid liquid may be removed by pptn. by  $\text{K}_4\text{Fe}(\text{CN})_6$  or  $\text{K}_3\text{Fe}(\text{CN})_6$ . The acid liquid dyes yellow and brown shades, and if applied to cotton acts as a mordant for cochineal. The acid liquid or a soln. of the neutral crystals may be subjected to a process analogous to diazotization, by treating them with  $\text{NaNO}_2$ , with  $\text{HCl}$  if necessary, and treating the fiber with the resulting bath, preceded or followed by  $\beta$ -naphthol or similar azo dye component; a metallic salt, *e. g.*,  $\text{KCN}$ , may be added to the grounding bath of  $\beta$ -naphthol, etc., or the cloth may be first mordanted with a metallic salt, *e. g.*,  $\text{KCN}$  or  $\text{K}_4\text{Fe}(\text{CN})_6$ , then treated with the bath of acid liquid and nitrite and finally with a developer.

**Wool-like effects on cotton fabrics.** G. HEBERLEIN. U. S. 1,288,884, Dec. 24. Pattern effects of wool-like appearance are produced upon cotton goods by alternately treating the material with a concd. caustic alkali soln. and  $\text{H}_2\text{SO}_4$  of 49–50.5° B $\acute{\text{e}}$ . At least 3 applications of the solns. are made, followed by washing and the material is stretched during at least one of the treatments. One treatment is applied to a portion only of the fabric so as to produce pattern effects. U. S. 1,288,885 relates to a similar method except that  $\text{H}_2\text{SO}_4$  of a somewhat higher concn. is used.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**Medieval pigments.** A. P. LAURIE. *J. Soc. Dyers Colourists* 35, 18–20(1919).—Historical. Mention is made of Egyptian blue (made by heating Cu or Cu ore, sand, soda and lime), ultramarine blue, purple from shell fish, gold dust, malachite green, red lead, vermillion, and orpiment. L. A. OLNEY.

**Report of sub-committee XIV on the preparation of iron and steel surfaces for painting.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 310–20(1918).—After one year's exposure, all the test panels (*cf.* C. A. 11, 405), which consisted of new and old steel plates which had been given various surface treatments such as pickling, sand blasting, wire brushing, etc., and then painted, were still so well protected against corrosion that no conclusions as to the relative effects of the different surface conditions could be reached. The only marked deterioration found in one set along diagonal lines was due to a process of straightening the plates during mfr. Complete data with photographs are given. F. A. WERTZ.

**Industrial colors and varnishes.** C. CLAUDIUS. *Rev. prod. chim.* 21, 170–1 (1918).—The most satisfactory protective coating to prevent the corrosion of metal products should be homogeneous and as chemically inert to the hydrolytic action of  $\text{H}_2\text{O}$  and to oxidation as possible. A bodied linseed oil containing copal and mixed with drier, thinner, and  $\text{ZnO}$  answers these requirements fairly well but is rather easily attacked by acids and fumes. The method of bodying the oil and "running" the copal are given. A paint with greater resistance is produced by using a polyterpene resin, made as follows: Treat 10 parts turpentine with one part 66° B $\acute{\text{e}}$ .  $\text{H}_2\text{SO}_4$ . Regulate the addition of acid to keep the temp. below 110°, and then agitate the mixt. for about 5 hrs. Two layers are formed. Draw off the polymer which constitutes the upper layer, wash thoroughly with  $\text{H}_2\text{O}$  and with 3%  $\text{Na}_2\text{CO}_3$  soln. to remove excess acid and organic salts such as borneol and camphene. Any emulsion formed during this process can be broken up by heating on the  $\text{H}_2\text{O}$  bath to 45–50°. The polymer

is subjected to a vacuum to remove  $H_2O$  mechanically held in the mass, and is then distd. at a pressure of 2 to 3 mm. The first fraction, coming over at  $165-175^\circ$ , is a clear liquid consisting essentially of pinene, limonene, cymene, etc.; it constitutes about  $\frac{1}{2}$  of the total product. These first fractions are repolymerized. The fraction between  $210$  and  $220^\circ$  is of a yellow color, sp. gr. 1.8 to 1.9. When the latter is mixed with copal, it produces a varnish of remarkable resistance. Best results have been obtained with a paint made of polyterpene 25%, hard copal 10%, blanc fixe 65%. This paint should be thinned with benzine, and used in several coats to get proper hiding power. F. A. WERTZ.

Some present-day aspects of the paint and varnish industry with special reference to the war. A. DE WAELE. *J. Soc. Chem. Ind.* 38, 2-4R(1919). E. H.

Report of sub-committee IX on varnish. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 305-8(1918).—The reports of the committee members are given, on a proposed elasticity test. This test consists in "reducing" the elasticity of the varnish by adding to it a definite amt. of  $33\frac{1}{2}\%$  soln. of "run" kauri gum in turpentine, flowing the mixt. on tin plate and allowing it to dry. The amt. of reduction that the varnish will stand before the film on tin plate will crack on bending is a measure of elasticity. Details of the method are given. F. A. WERTZ.

Tentative specifications for foots permissible in properly clarified pure raw linseed oil from North American seed; serial designation D51-18T. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 615-6(1918).—The amt. of foots shall not exceed 2% by vol. Det. foots by shaking 25 cc. of the oil at  $70-80^\circ$  for exactly 1 min. with 25 cc.  $Me_2CO$  (U. S. P.) and 10 cc. of a 10% by vol. soln. of HCl (sp. gr. 1.2) in  $H_2O$  satd. with  $CaCl_2$ . Pour the mixt. into a buret and allow to settle 24 hrs. and then read the vol. of the foots strata lying between the  $CaCl_2$  layer and the oil- $Me_2CO$  layer. F. A. WERTZ.

Report of sub-committee V on linseed oil. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 299-300(1918).—Reports are given of the committee members on oils examd. during the year, with special reference to the foots test (see preceding abstract). F. A. WERTZ.

Tentative specifications for flash point of paint thinners other than turpentine; serial designation D28-18T. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 685-8(1918).—The flash point shall be detd. with the Tag closed tester operated according to the specific directions given. For unofficial tests, any suitable closed type tester may be used. F. A. WERTZ.

A study of the fatty acids obtained from varnish oils and from varnishes. W. T. PEARCE. *J. Ind. Eng. Chem.* 11, 121-6(1919).—P. found that as little as 5% tung oil present in linseed oil raises  $n$  of the mixed fatty acids derived from the oils directly; but the values obtained from the fatty acids derived from varnishes were not in good agreement (cf. *C. A.* 11, 1315). Changes in  $n$  of mixts. of other oils with linseed were not appreciable. I-jelly tests (Boughton, *C. A.* 4, 2049) made on the mixed fatty acids detected 10% tung oil in linseed, 20% in soy-bean and in menhaden oil mixts., and 25% in varnishes. Results are tabulated. F. A. WERTZ.

Po-yoak oil, a new drying oil. ANON. *J. Ind. Eng. Chem.* 11, 156(1919).—Po-yoak oil, derived from a species of *Parinarium* in Sierra Leone, is pale yellow in color, contains a deposit of dark-colored "stearine," resembles tung oil in odor, and its high I no. places it in the class of drying oils. F. A. WERTZ.

Pigment containing titanium oxide. L. E. BARTON. U. S. 1,288,473, Dec. 24. Pigments of good opacity are produced by treating Ti sulfate solns. (such as those



prepd. according to the methods of U. S. pat. 1,155,462 (C. A. 9, 3369) or 1,205,144, (C. A. 11, 216) with pigment bases such as barytes, silica, china clay or asbestine and also pptg. sulfate bases in the soln. and then pptg. the Ti compds. from the soln. A composite pigment results from coalescence of the freshly pptd. particles and other added pigments.

**Coating metal surfaces.** N. C. F. JENSEN. Brit. 121,150, Nov. 6, 1917. A preservative coating is formed on metallic articles by dipping the article into an oil, e. g., a mixt. of whale oil and mineral oil, draining, and then heating to a temp. high enough to gasify the volatile constituents in an oven which permits the escape of the lighter gases. A suitable oven is one having an outlet at the top, the aperture of which can be varied, and a suitable temp. is about 300°. Cf. 2,022, 1873, 4,486, 1874, 9,570, 1888, 9,848, 1888, 1,146, 1896, 3,682, 1904, and 3,945, 1915 (C. A. 10, 2157).

**Preserving metal from rust.** W. C. A. MATH. Brit. 120,619, Nov. 14, 1917. In a process of preserving metal articles from rust by heating and immersing them in linseed oil, either alone or mixed with other substances, the linseed oil is maintained at a boiling temp.

**Resins and resinous compounds.** J. R. KOHLER. Brit. 120,729, Nov. 7, 1918. Shellac substitutes for use in making polishes and insulating materials are produced from natural resin, water resin, or colophony by isolating therefrom the amorphous constituents consisting of oxidized resin acids. Preferably the cryst. resin acids are first extd. by a solvent such as ether, benzene, oil of turpentine, or mineral oils, and the residue is then extd. with EtOH or MeOH giving a soln. corresponding with a soln. of shellac. This soln. may be used as a polish, or a solid shellac substitute may be recovered therefrom by evapn., and subsequently purified by sapon. with alkali and pptn. with acid. The product may be converted into metal salts or esters by treating with metal oxides, glycerol, and the like. To increase the proportion of shellac substitute recoverable, the raw material may be first oxidized under moderate heat by means of air, O, or ozone.

## 27. FATS, FATTY OILS AND SOAPS.

R. SCHERUBEL.

**Elm-seed oil.** HANS KREIS. Basel. *Schweis. Apoth. Ztg.* 56, 483(1918).—Preliminary note. The av. wt. of the winged seed was 7 mg.; without wing 5.5 mg. Only traces of starch were present. The seed, wings removed, contained H<sub>2</sub>O 9.3, ash 5.09, crude fiber 5.95, N substance 34.35, fat 28.22, N-free ext. 17.09%. The seed are excellent as chicken feed. The oil extd. with Et<sub>2</sub>O is greenish, odorless and tasteless and solidifies incompletely at 0°. When shaken with 75% H<sub>2</sub>SO<sub>4</sub> it turns a permanent olive-green, with HCl (d. 1.19) light green. No striking test is obtained with HNO<sub>3</sub>, and Bellier's test is indistinct. A mixt. of concd. H<sub>2</sub>SO<sub>4</sub> and concd. HNO<sub>3</sub> produces a passing green then a permanent coffee-brown color. Solstien's reagent at 40–50° produces a transient red. The consts. of the oil are d. 0.9374, acid no. 15.9, refraction no. at 40° 36.0, sapon. no. 274.1, I no. 31.8, Reichert-Meissl no. 3.0, Polenske no. 33.5. The high content of volatile fatty acids with low olein content is notable. When distn. was continued with renewal of H<sub>2</sub>O until 500 cc. were obtained, the Reichert-Meissl no. rose to 7.3, the Polenske no. to 121.5. Hence the volatile fatty acids are mainly insol. in H<sub>2</sub>O. The seeds also seem to be rich in lipolytic enzymes, since the acid no. increases to 160.5 when the crushed seeds are allowed to stand with H<sub>2</sub>O for 24 hrs. at an elevated temp.

S. WALDBOTT.

**Determination of unsaponifiable matter in fats and oils.** LEO MEYER. *Mitt. Lebensm. Hyg.* 9, 283-4(1918).—Comparison of results obtained on oils and fats and mixts. containing paraffin oil showed that the detn. of unsaponifiable matter by 2 sapons. was very little lower than that by 1 sapon. H. E. WOODWARD.

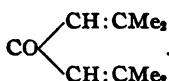
**Utilization of glycerol residues from Reichert-Wollny (Leffman-Beam) estimations.** A. E. PARKES. *Analyst* 43, 408-9(1918).—The cold residue from the detn. is filtered into a stock bottle. Sufficient solid  $\text{Ca}(\text{OH})_2$  is added to combine with total  $\text{SO}_4$  and the mixt. is boiled and filtered after intermittent shaking for a few hrs. The filtrate (dil. glycerol, NaOH and traces  $\text{CaSO}_4$ ) is concd. to  $1/2$  vol. when it will be approx. the required NaOH strength. Results with recovered glycerol were identical with fresh but the blank was somewhat higher due to sol. fatty acids in the original residue.

H. A. LEPPER.

**The manufacture of glycerol.** GEORGES VIR'. *Rev. prod. chim.* 21, 355-6(1918).—Description of well known processes. E. SCHERUBEL.

**The hydrolysis of soap solutions, measured by the rate of catalysis of nitrosotriacetnamine.** JAMES WILLIAM MCBAIN AND THOMAS ROBERT BOLAM. Bristol Univ. *J. Chem. Soc.* 113, 825-32(1918).—As a method of study the rate was investi-

gated of the catalysis of the reaction  $\text{CO} \begin{array}{c} \text{CH}_3.\text{CMe}_2 \\ \text{CH}_3.\text{CMe}_2 \end{array} \text{N.NO} \longrightarrow \text{H}_2\text{O} + \text{N}_2 +$



This reaction is unimolecular and its velocity is proportional to the concn. of OH ion. The volumetric method was used and was found to be accurate to within about 2 or 3% at ordinary temp. The results obtained show that the alkalinity of all soap solns. is low and cannot account for more than a few % of the cond. of soaps, except in very dil. solns. The alkalinity of soap solns. decreases with falling temp., but is increased again when the soln. solidifies or becomes heterogeneous. The concn. of the OH-ion in soap solns. is only of the order of magnitude of 0.001 N. This, however, is quite sufficient to exclude the existence of free fatty acids in soap solns. except in very minute amt. MAX PHILLIPS.

Soft soaps (WOODROFFE) 29. Cleaning and dyeing with volatile solvents (HEY) 25.

CHALMERS, T. W.: *The Production and Treatment of Vegetable Oils.* London: Constable & Co., Ltd. 218. net. For review see *Chem. Trade J.* 64, 97(1919).

FRYER, PERCIVAL J. AND WESTON, FRANK E.: *Technical Handbook of Oils, Fats and Waxes.* Vol. II. Cambridge: The University Press. 158. net. For review see *Chem. Trade J.* 64, 97(1919); cf. C. A. 12, 436.

MAXTED, E. B.: *Catalytic Hydrogenation and Reduction.* London: J. & A. Churchill. 48. 6d. net. For review see *Chem. Trade J.* 64, 97(1919).

**Purifying fatty oils.** SUPERIOR OIL & PROCESS CO. and W. P. SCHUCK. *Brit.* 120,820, Dec. 31, 1917. Fatty oils are purified by passing a current of H through them in the absence of catalysts at temps. not below  $185^\circ$ . The oils are thus deodorized, their free fatty-acid content is reduced, their I numbers are lowered, and they are rendered resistant to the development of rancidity. Castor oil is treated at  $185^\circ$ , eel oil and codliver oil at  $300^\circ$ , and corn oil at  $250^\circ$ , the operation being effected in 1-2 hrs. A suitable app. is specified.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Report of committee on sugar manufacture and utilization of by-products, Hawaiian Sugar Planters' Association, 1918. HORACE JOHNSON. *Louisiana Planter* 61, 395-8, 411-3 (1918).—Cane shredders have given great satisfaction. By their use the extn. has been raised to 97.1% of the sucrose in the cane, and the capacity of the mill has also been increased. The use of shredders may make it possible to replace milling by diffusion. Expts. on centrifugal clarification have given no definite results as yet. Tests with the Oliver continuous filter have also failed so far to give results. Revolving screens employed to strain clarified juices or sirups have been found satisfactory. The most favored type of multiple effect is the quadruple, with pre-evaporator, the vapor from which is utilized for heating raw juices. The boiling capacity of the factories has been increased, and this, in conjunction with better management of the pans, has resulted in an improvement of the sugars. A table is given showing the compn. and size of grain of sugars turned out by the different plantations. 21 mills out of 40, representing 60% of the total output of the islands, have made satisfactory sugar, against 14 out of 42 in 1917, and 4 out of 31 in 1916. This is a better performance than in Cuba, but still further improvement is needed. The total recovery in 1918 was 2.23% higher than the av. of 1909 to 1914, and the extn. 3.24%, which shows that increased extn. is followed by increased recovery, amounting to 14,500 tons of sugar for the islands. The total loss in manuf. amounts to 12% of the total sugar; 25% of this is lost at the mill, 1.75% in press cake, 58.25% in molasses, and 15% is undetd. The molasses is exhausted to an av. of 40 gravity purity. Lab. tests have shown that it is possible to reduce the purity to from 28.14 to 31.67, but it remains to be detd. how low a figure can be reached in actual practice. Undetd. losses, caused by fermentation, may be reduced by cleanliness and use of formalin. Expts. in Java have shown that as much as 6% of the total sugar may be lost by the activity of microorganisms at the mill, and for this reason extreme cleanliness is imperative at that station. Losses by entrainment can also be reduced by proper manipulation and cleanliness. Further studies should be made towards obtaining still higher extn., a better recovery from low-grade massecuites, and improvements in methods of clarification. One new method of clarification, advocated by Peck and Adams, consists in filtering the clarified juice through decolorizing carbon made from a mixt. of final molasses and kieselguhr with concd.  $H_2SO_4$ . In lab. tests increases in purity of 4.4 to 1.5 points were obtained, and removal of 95% of coloring matter, decreasing with repeated use to 70%. A large decrease in gums and ash was effected. Almost as good results were obtained in a small-scale expt. with a filter press. The C is again freed from the impurities taken up by washing with hot water and steaming. The C-treated juices were boiled to sirup and to grain much more rapidly than ordinary clarified juices. Later a still larger expt. was made with satisfactory results, in spite of adverse conditions. The juice was readily concd. with no scale formation. The ash of the C, 30% at the beginning, increased after repeated use to 60%. *Utilization of by-products: Bagasse as fuel* is worth as much per ton as oil per barrel. Bagasse will shortly be utilized in Hawaii for the manuf. of an *asphalt roofing paper*, employed in cane cultivation, and of other paper products. The bagasse is sifted to remove pith, treated with steam and lime, sent through the beaters, oven drying screens, further dried in mills, and pressed. It is then satd. with 40% asphaltum. The cost of manuf. is \$30 per ton. *Press cake* is used exclusively as *fertilizer*. Various sugar men in the islands place the value of press cake at \$5 to \$20 per ton, with an av. of \$10. The actual value will have to be detd. by field tests. *Molasses*: Sixty % of the total output is sold, 7% fed to stock, 15% used as fuel, 10%

for manuf. of potash, and 8% thrown away. As fuel, molasses is worth the same as bagasse; when burned for potash, \$15 per ton, at \$5 per unit of potash. The actual selling price is \$7 per ton. A new outlet for waste molasses may be the conversion into denatured alc. as a gasoline substitute. The denaturing formula, approved by the Internal Revenue officials, is 100 gals. alc., 25 gals. ether, 2 gals. benzine, 1 gal. pyridine. The distillery slops will still contain all of the fertilizing constituents of the molasses, and they alone will more than pay for the molasses. F. ZERBAN.

Some notes on present conditions in Louisiana sugar houses. C. E. COATES. *Louisiana Planter* 61, 393-4, 410-1(1918).—There is at present a tendency, to be encouraged, towards the manuf. in Louisiana of sugars, sirups and molasses for direct consumption, without refining, processing or blending. All these products must be carefully standardized. High-grade sugars should invariably be passed through granulators; first molasses should be of about 50 to 53 purity, second molasses of 37 to 40 purity, and both of them of about 78° Brix. More attention ought to be paid to flavor than to color. A number of improvements are pointed out, which will favorably affect quantity, quality, and cost of the products. The principal ones are deep grooving of the mills; increased extn. by the use of crushers, shredders, and larger number of rolls, up to nine; filtration of the entire juice by the use of bag filters and presses, and possibly that of the newer types of filters, like the Kelly and Sweetland press, and centrifugal filters; a greater effort in keeping the effects clean, not only the lower part, but the entire body and dome, to prevent contamination with iron which imparts a dark color to the sirup; the exptl. use of one of the new acid- and alkali-proof paints in the effects; a more elastic way of connecting the different bodies of the effect, so that one or more of them may be disconnected and cleaned while the others are being used; boiling of the sirup to high density, in order to shorten the boiling in the pan which will save fuel and give a sugar of better color; the more general introduction of calandria pans, with two coils if necessary; double purging of the sugar; use of more crystallizers, provided with seeding devices; greater attention to the fuel-saving problem; washing and accurately weighing all the cane entering the mill; more extended chem. control, and, if possible, mutual control. An excellent sirup has been made in an exptl. plant by Dale. Neither lime nor S was used. The juice was mixed with kieselguhr, boiled and filtered. Invertase was added to the partly cooled juice, and the latter boiled to the desired d. A sirup of good flavor is obtained in this way. F. ZERBAN.

Experiments on methods for preventing the decomposition of frozen canes. W. E. CROSS. *Rev. ind. agr. Tucuman* 9, 51-6(1918).—Neither windrowing, nor topping of the standing cane, as practiced in Louisiana, showed any advantage over leaving the cane standing without any treatment, as was shown by field tests made after the heavy freeze of June 23, 1918. The topped cane, and more so the windrowed cane dried out considerably, and their purity decreased rapidly, while the standing cane kept fairly well. F. ZERBAN.

Report on milling in Hawaii. J. P. FOSTER. *Intern. Sugar J.* 21, 17-22(1919).—From the replies to a questionnaire concerning the economic limit of extn. the conclusion is drawn that the fuel expense is the only limiting factor, and that extn. should be pushed as high as possible. As high as 75 to 80% of the sucrose extd. can be recovered. F. ZERBAN.

Seedling sugar canes. J. B. HARRISON. *Intern. Sugar J.* 20, 558-60(1918).—Reprinted from *Agr. News*. It has been very difficult to produce seedling canes which will not soon show signs of degeneration when second and third ratoons are grown, while it is comparatively easy to breed varieties which will hold up well, if replanted every year or two. Up to 1902 breeding work in Demerara consisted mainly

in the selection of seedlings obtained by chance fertilization, the principal object being vegetative vigor and high sugar content. Controlled cross-fertilization has so far proved rather disappointing. The natural varieties represent very complex hybrids, and are therefore unsuitable for this particular purpose. It is to be expected that from strains of high purity valuable varieties may be derived by controlled cross-fertilization, but this procedure is naturally very slow. F. ZERBAN.

**The new American polariscope.** CHARLES E. COATES. *Louisiana Planter* 62, 58-9(1919).—Report of a committee appointed by the Louisiana Section of the A. C. S., to draw up specifications for a saccharimeter to be manufd. in the U. S. The principal features recommended are: The adoption of the "international" normal wt. of 20 g. per 100 true cc. at 20°; field of vision divided into halves, not into 3 parts; light filter to be placed between instrument and light source, and not within the instrument; single quartz wedge compensating system, ranging from +110 to -35. The Jellet-Cornu prism is recommended for instruments to be used in the tropics, but the choice between this system and the Lippich should be optional with the purchaser. There are some further minor suggestions regarding mechanical design. F. ZERBAN.

**The manufacture of polariscopes in the United States.** C. A. BROWNE. *Louisiana Planter* 62, 12-4(1919).—Tentative specifications for a polariscope have been submitted to sugar chemists in the U. S., Hawaii and Cuba, so that any instrument to be manufd. in the States may conform as much as possible to the wishes of prospective users. The advantages of the 20 g. normal wt. are again enumerated. Extracts are given of letters from a number of sugar chemists, most of whom favor the adoption of this normal wt. F. ZERBAN.

**Baumé or Béaumé?** C. A. BROWNE. *Louisiana Planter* 61, 363-4(1918).—There is considerable confusion among authors concerning the spelling of this name. The proper spelling is that used by the chemist in question himself, which is "Baumé." The use of the Baumé scale in the sugar industry should be abandoned, in favor of the Brix scale, because Baumé degrees must first be converted into Brix degrees, to have any definite meaning. F. ZERBAN.

**The Mauritius sugar industry.** H. A. TEMPANY. *Intern. Sugar J.* 20, 554-8 (1918).—Report of the Dept. of Agr. of Mauritius for 1917. Methods of manuf. are constantly improving, and good progress is being made in the fight against insect pests. Root disease is, however, becoming more prevalent. Labor-saving implements could be used to a larger extent. Chem. factory control is gaining ground. Fertilizers should be used more judiciously, on account of their high price. The cane area under irrigation is spreading from year to year. Close attention should be paid to the cost of production, to offset any decrease in sugar prices, and the partial loss of the Indian market. F. ZERBAN.

**The sugar industry in Mexico.** ANON. *Bull. chambre de commerce française du Mexique; Intern. Sugar J.* 20, 547-50(1918).—The production of sugar has steadily declined, from 160,000 tons in 1910-11 to 35,000 tons in 1917-18, on account of the political disturbances. There is no possibility of reviving the industry until uninterrupted peace is again established in the country. F. ZERBAN.

**France. The beet sugar campaign of 1917-18.** GEORGES DURBAU. *Intern. Sugar J.* 20, 540-2(1918).—This article contains mainly statistical data on the production of beets, sugar and molasses, and on prices of these products. Production of beets per acre, sugar content of the roots, and factory output were better than during the previous year. The proportion of first masseuite to second and third has steadily risen since the introduction of crystn. in movement and of boiling back methods. French factories compare well, in most respects, with those in other countries, but the cost of

manuf. could be further reduced by increasing the capacity of the factories, and by more economical fuel consumption.

F. ZERBAN.

Brazil. The sugar industry. ANON. *Board of Trade J.*; *Intern. Sugar J.* 20, 538-9(1918).

F. ZERBAN.

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Extraction apparatus (Brit. pat. 120,448) I.

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BÖSEKEN, J.: *Beknopte scheikunde der suikers.* 2nd Ed., revized. Delft: Technische Boekhandel en Drukerij J. Waltman, Jr. 135 pp. For review see *Chem. Weekblad* 15, 1644(1918).

ROUX, EUG. AND MUTTELET, C. F.: *Aliments sucrés.* Paris: Ch. Béranger, 15 rue des St. Péres. 474 pp. For review see *Rev. sci.* 56, 443(1918); cf. *C. A.* 9, 1258.

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## 29. LEATHER AND GLUE.

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ALLEN ROGERS.

Scudding, its uses and functions. J. R. BLOCKEY. *Shoe and Leather Rep.* 141, 143, Dec. 26, 1918; 79, 81, 90, Jan. 2, 1919.—Scudding is a process generally applied to hides and skins after liming and unhairing. It consists in passing the knife over the grain with a pressing motion. Scudding is also often performed after any of the various operations up to tanning. The changes brought about by liming enable one to remove by scudding not only the short hairs, the epidermis, and surface dirt and coloring, but also to squeeze out some of the liquefied fat and hide or cementing substances, and the lime soaps. The removal of these substances is, for certain purposes, important. Short hairs not removed will become firmly fastened in tanning and will seriously interfere with finish and dyeing, especially for black upper leather. Grease particularly, and also the coloring matters from the hair roots, if not removed, cause trouble in uniform dyeing. Tanning is actually prevented or retarded at times by grease. Scudding several times, as for example, after unhairing, fleshing and possibly liming, has been known to be very effective in tanning greasy hides. With heavy leathers scudding after acid deliming has certain advantages in that there is a saving of the hide substance due to the pptg. of the latter in the hide by the acid. One disadvantage is the danger of scudding-knife marks which may become fixed in the tanning. Suspension of the delimed, scudded hides overnight in H<sub>2</sub>O before tanning will overcome the danger of lasting knife marks. Light skins may be scudded several times and after any of the foretanning stages.

R. W. FREY.

Alum-tanned boot leather. F. T. HOWARD. *Leather World* 10, No. 46, 845-6; No. 50, 934-5(1918).—While pure alum-tanned leather is principally used to-day for belt laces, combing leathers, and sometimes for picker bands, it was at one time, after being further treated with egg yolk, flour, and oil, extensively used as calf kid for boots and shoes. As a matter of record, the manuf. of this leather is given. Soaking, liming, unhairing, fleshing, drenching, dressing with egg yolk, flour, and oil, tawing, drying, staking, dyeing, ironing, and finishing with soap, oil, and beeswax are described in detail. Also in *J. Am. Leather Chem. Assoc.* 14, 62-8(1919).

R. W. FREY.

Chrome-tanned Buffalo hide picker bands. E. H. HOWARD. *Leather Manufacturer* 30, No. 1, 11-4(1919).—This leather is used in the weaving districts throughout the world. It must be very soft and tough, but not too greasy, as the friction on the bands heats them and softens the grease, causing it at times to drip and soil the cloth being woven. So-called "raw hide" bands, while extensively used, are not so favorably

considered as is chrome leather, probably because of the comparatively greater detrimental effect of the heat upon the former class of stock. English or salted ox hides are the very best ones to use but generally dried buffalo hides imported from East India, China, and the Dutch Colonies are utilized. Because of poor curing and handling, many of the hides are defective when received but may not be noticed until soaked so that as a general thing the manufacturer of picker bands from buffalo hides would do well to buy his raw goods already limed, fleshed and trimmed with bellies and shoulders off. This can be done from the firms who buy buffalo hides and sort them after fleshing for their clients. When starting with dry hides they should be selected for weight before soaking. After soaking, milling, liming, and fleshing the sound goods of the lighter class are selected for picker bands. As little splitting as possible should be done in order not to sacrifice any toughness. Bating is generally done with hen or pigeon manure, although several of the patent bates are satisfactory. Lactic and formic acid may also be used. From the bate a very soft, silky hide should be obtained. Pickling with  $H_2SO_4$  and NaCl or better yet alum and NaCl follows: Both the one- and two-bath processes of Cr tanning are used and are described; the latter is recommended. The goods are then neutralized with 2%  $Na_2B_4O_7$  and fat-liquored with soap and castor or neatsfoot oil. Stuffing follows, and such a mixture should be selected that the subsequent working temp. for the band will not cause the grease to soften and fly off. A mixt. of 30 lbs. of hard stearin, 30 lbs. of paraffin wax, 20 lbs. of tallow and 20 lbs. of oil is suggested, but the quantities should be varied some what to suit the requirements of any particular weaver. The leather is set out well and dried. Piling in a cool place for about 3 weeks makes it more mellow and pliable. French chalk is then rubbed in on both grain and flesh and the leather is cut into bands, which process is briefly described.

R. W. FREY.

**Absorption of tannic acid in sole-leather manufacture.** ALLEN ROGERS. *J. Am. Leather Chem. Assoc.* 13, 520-7(1918).—Analyses are given of leather samples on wet and dry basis taken beginning with the raw hide and at frequent stages in the rockers, layers, etc., tempering pit, bleach, oil wheel, loft and after rolling. Analyses of liquors from tail rocker to head third layer are given, and other liquor analyses to show the effect of taking samples at top, middle and bottom of the pits. The results indicate that over half of the tannage is accomplished during 15 days in the rockers and that after 13 days in the press layers tannage had reached  $\frac{4}{5}$  of the total absorption. The cost per hide, on a basis of 7 cents per tan unit, of putting stock through the yard is \$1.264 in rockers, \$0.3175 in press layers, \$0.1125 in first layer, \$0.2600 in second layer, \$0.0264 in third layer, or a total of \$1.9804. Analyses of samples of liquors taken from the top, middle and bottom of pits show higher tannin in the middle and bottom portions; a point which should be considered in taking an inventory. Analyses are also given of the sludge from the ext. house and rocker pit. It is concluded that a sample analysis of yard liquors is not sufficient basis for calcg. the complete cost system; that the degree of tannage is not subject to a mathematical calculation; and that the yard should never be considered as half-tanned.

J. S. ROGERS.

**Shark-skin leather.** ALLEN ROGERS. *J. Am. Leather Chem. Assoc.* 13, 528-30 (1918).—After numerous expts. in the tanning of shark skins the following procedure was found to give the best results: Upon arrival the skins are cut into sides, soaked 24 hrs., washed thoroughly, placed in paddle in a 0.2% NaOH soln., stirred occasionally for 2 days, washed, and fleshed by machine or by hand. The grain which was still harsh was beamed with a blunt knife to remove shagreen. The difficulty in removing the outer layer which appears much like rough sandpaper was partially overcome by the NaOH treatment. The fleshed beamed stock was bated with  $NH_4Cl$  at 100° F., using 3% of the wt. of the stock, and washed. The stock was tanned as follows:

The skins were drummed until struck through in a soln. containing 5%  $\text{Na}_2\text{Cr}_2\text{O}_7$  and 2.5%  $\text{H}_2\text{SO}_4$  in 5 gals. water to each 100 lbs. of stock, horsed overnight, then drummed with 6 lbs.  $\text{NaHSO}_3$  in 4 gals. water to each 100 lbs. of stock until the chrome was entirely reduced, then horsed overnight. From this stage the skins can be finished as regular chrome stock; but better results are obtained by retanning in quebracho, running for 1 hr. in a 10° Bk. quebracho liquor, then until struck through in a 30° Bk. liquor, and finally 5 days in a 40° Bk. quebracho layer. The skins are then fat-liquored or stuffed according to the grade of leather desired.

J. S. ROGERS.

**The non-tannin enigma.** JOHN A. WILSON AND ERVIN J. KERN. *J. Am. Leather Chem. Assoc.* 13, 429-38(1918).—This work was inspired by a letter from Alsop giving results of expts. which he had carried out on the detn. of non-tans of a chestnut ext. under different conditions of concn. of soln. and amt. of hide powder, and also by the results obtained by the Committee on the Effect of Hard Water on Tannins (*C. A.* 13, 84). Results of expts. on shaking pure solns. of salts and other non-tanning materials with chromed hide powder are tabulated and indicated graphically. These results were calcd. approx. before the expts. were performed by application of formulas published by Procter and his collaborators from time to time on the theory of the equil. of colloid jellies and electrolytes. Solns. of gallic acid, cane sugar,  $\text{NaCl}$ ,  $\text{H}_2\text{SO}_4$ , and  $\text{MgSO}_4$  were used. The non-tannins are divided into the following types: electrolytes which do not combine with hide powder; non-electrolytes which do not combine with hide powder and substances which do combine with hide powder. The influence of the presence of each type of non-tannins on the analytical results is discussed fully. The results show that the addition to a tan liquor of any sol. substance having no action on the hide powder will tend to raise the % of non-tannins to a figure higher than its true value while the addition of any sol. non-tanning substance which combines to a very appreciable extent with the hide powder will tend to decrease the non-tannin figure. The error in either case is increased by using large proportions of hide powder and is decreased by using more concd. liquors. In Alsop's expts. decreasing the concn. from official to  $\frac{1}{4}$  strength only lowered the non-tannins from 18.76 to 18.30 while decreasing the amt. of hide powder from 50 to 12.5 g. raised the % of non-tannins from 18.30 to 22.07. It is in closing that in a liquor of definite tannin content an alteration of the nature or concn. of non-tannins will cause a corresponding change in the % of tannin obtained by the official method, even though there actually is no alteration on the tannin content nor emphasized in the amt. of tannin removed from soln. by the hide powder. It is therefore not permissible in investigational work to compare the tannin figures of liquors containing different kinds or amts. of non-tannins without taking this into consideration."

R. W. FREY.

**The "forsare" liming process.** ANON. *Leather Trades Review* 822-3, Dec. 11, 1918.—A description is given of a liming process in use at the Messrs. William Walker and Sons, Ltd., Bolton plant, which was referred to by Mr. C. E. Parker in a recent lecture as the "Walker-Bolton" method. The essential features are constant agitation of the liquors by compressed air from tubes across the bottom of the pits and removal of these liquors by air lifts. The suspended hides are soaked and limed in the same pit without being removed until ready for unhairing, thereby saving much labor. Because of the constant agitation, soaking and liming are very uniform, efficient, and rapid. Liming is completed in from 3 to 4 days, the hides are thoroughly plumped and do not suffer the loss of much hide substance. Only about 3 lbs. of lime per hide are required instead of from 8 to 10 by the old processes. In order to make the liming less subject to seasonal variations in temp., the compressed air is heated to the av.



summer temp. Air pressure from 12 to 15 lbs. above atm. pressure is ample and the compressor for 1000 hides per week capacity requires at the max. 15 h. p.

R. W. FREY.

**Methods of bating and drenching.** ANON. *Leather Manufacturer* 30, No. 1, 7-8(1918).—New England tanners call killing the lime "drenching," while the same process is called "bating" by Pennsylvania and Delaware tanners. Bating is usually done in the paddle and should never be done in stationary tubs. Overbating will give loose-grained and spongy leather, while underbated skins still contain lime and will produce hard, brittle, and cracky leather, which in fancy dyeing will give uneven color. Excrement bates, besides their disagreeable features, vary in strength and action. Their control requires skilled tanners, and even then the result is uncertain. These bates consume much of the gelatin of the skin which is the life of the fiber and besides makes for fineness of texture and toughness of the leather.  $H_2BO_3$  gives excellent results as a bate, and when used with a bacterial bate is one of the best lime cleansers known. For drenching or bating light skins bran is mostly used. An emulsion of bran, middlings, or flour is allowed to ferment until quite acid before immersing in it the hides and skins. The bran drench is a long and likewise dirty, uncertain operation. It is often claimed that the acid-forming ferments saturate the skins and are carried over to the tanning liquors where they cause further acid fermentation. Weeds containing tannin are sometimes present in the bran and may cause spotted and cloudy tanned stock. Some of the patent bates give gratifying results. For proper bating more than killing the lime is necessary. The skins must be reduced to a certain extent by some bacterial action, after which a bath in  $H_2BO_3$  will remove all remaining lime.

R. W. FREY.

**Niter cake as a substitute for sulfuric acid.** J. B. CHURCHILL. *Shoe and Leather Rep.* Oct. 24, 1918; *J. Am. Leather Chem. Assoc.* 13, 607.—A report to the Tanners Council. Data on the production of niter cake in the U. S. show an almost unlimited quantity produced in widely scattered sections of the country. Analyses of many samples show 26-40% acid as  $H_2SO_4$ . The selling price f. o. b. shipping point, varies from \$2 to \$9 per ton. Reports from tanners indicate that niter cake has been successfully used in bleaching sole leather, for deliming previous to Cr tanning, for pickling, and in making up one-bath Cr liquors. The large amt. of  $Na_2SO_4$  in niter cake should be allowed for in making up mixtures which should contain  $H_2SO_4$  and salt.

R. W. FREY.

**Cu-Nao. Its utilization in tanning.** JALADE. *Bull. sci. pharmacol.* 25, Pt. 2, 298-301(1918).—The so-called "dry extract" of this common plant (*Dioscorea atropurpurea* Roseb.) of Indo-China consists of dried slices of the tubers and is not, properly speaking, an ext. 100 parts contain 16.43  $H_2O$ , 20.20 tannins absorbed by hide powder, 7.07 sol. nontannins, 26.8 starch, 3.24 N-contg. derivs. (Kjeldahl), 0.32 fat, 25.94 cellulose. The tannins were detd. in the soln. obtained by exhausting with  $H_2O$  at 50°, the use of higher temps. being inadvisable owing to the large amt. of starch present. The tannins belong to the pyrocatechol group and give a grayish ppt. with ferric salts. A reddish yellow coloring matter is also present. Ash 2.10%, strongly alk. in  $H_2O$ , contains  $SiO_2$  and  $CO_2$ , with traces of Al, Fe, Ca and Mg tests for K were negative. After extn. of the tannin the residue might be used as a feed, but the difficulty of drying and the rapid development of molds are obstacles.

M. HEIDELBERGER.

**Notes on soft soaps.** D. WOODROFFE. *Leather Trades Rev.* 1918, 820, Dec. 11.—Attention is called to the inferiority of soaps during the War. Many of the so-called soft soaps on the market do not appear either to be potash soaps or to contain any glycerol, which is misleading since English and Continental technologists describe

soft soaps as potash soaps containing glycerol. Analyses of samples of com. soft soaps are given and show that most of them do not contain any glycerol. By the modern methods of soap-making the oils and fats are first hydrolyzed, thus permitting a sepn. of the glycerol from the fatty acids, which are then mixed with the necessary amt. of alkali to furnish soap. Most of the soft soaps are merely ordinary soda soap with a higher  $H_2O$  content. While the value of glycerol in leather dressing is a much disputed point, W. still is of the opinion that the glycerol content of soft soaps is an important factor in their use for fat liquoring. The glycerol in the soft soap makes the emulsion more stable and the globules of oil more finely divided. In view of the difficulty of purchasing genuine soft soaps it is recommended that the leather dresser prepare his own. Not only is this easily done but the best and most suitable oils can be used.

R. W. FREY.

**Leather compositions.** H. E. WHITE. Brit. 120,802, Dec. 7, 1917. Leather waste or scrap is first treated with weak acid soln., *e. g.*, 10% strength HCl, or with acid and salts such as  $MgSO_4$  or NaCl. The excess of acid may be removed and the waste heated to, say,  $100^\circ$ , with or without stirring or crushing or otherwise working to produce a homogeneous mass, which may be rolled, pressed, extruded, etc., or, after treating with acid, the waste may be heated alone, or with methylated spirit, olive or other oil, or gelatin, until it becomes homogeneous and may be worked. The product is then hardened by HCHO, Cr compds., tanning exts. or compns. (including those prepd. synthetically), or by picric acid alone or in combination with oils. During the treatment, organic or inorganic filling materials may be added.

**Tanning.** K. BENDIXEN. Brit. 120,398, Oct. 26, 1918. Fishskins, etc., are treated prior to tanning to ext. the oil and fatty matters either wholly or partially. The extn. is effected by treating the skin with any fat-removing means, *e. g.*, a lye consisting of a soln. of  $Na_2CO_3$ , etc., and the excess of lye is neutralized by an acid, such as weak HCl. The skin is washed either after the treatment with lye or after the addition of acid.

**Tanning.** L. R. PAYRACHE and O. V. BAILLY. Brit. 120,928, Nov. 22, 1918. A bate for the treatment of hides consists of an opotherapeutic pancreatic powder, prepd. from fresh pancreatic glands and contg., in addition to the water-sol. principles of said glands, the whole of their sol. and insol. enzymes. One method of prepg. the powder consists in finely triturating fresh pancreas and mixing the pulp with acetone, filtering, and pressing the residue. This residue is subjected to two further treatments with anhydrous acetone, and, when dry, is powdered. The powder is dissolved in  $H_2O$  at  $30-40^\circ$ , either alone or after mixing with a similar powder obtained in a like manner from fresh mucus of the small intestines, and may be mixed with neutral or faintly alk. or acid unliming agents, with the addition of inert substances such as cellulose, or its derivs., etc.

**Glue.** R. W. MUMFORD. U. S. 1,289,053, Dec. 24. Clear and decolorized glue or similar product is produced by mixing the gelatinous material, in soln., with decolorizing C, and also with a small amt. of kieselguhr, agitating the mixt. vigorously, sepg. the decolorizing material, and then cong. the soln.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

Technical course in rubber manufacture. H. E. SIMMONS. *Rubber Age* 3, 118-20, 169-71, 210-12, 249-51, 294-6(1918).—Section XXII: Analysis of Manufactured

Rubber. Section XXIII: Physical testing of compounded samples. Cf. C. A. 12, 103, 342, 871.

JOHN B. TUTTLE.

Rubber substitutes, or vulcanized oils. ANDRÉ DUBOSC. *Chimie et industrie* 1, 727-32(1918).—A description of the methods used in the manuf. of white and brown rubber substitutes. It contains nothing new.

JOHN B. TUTTLE.

Accelerene: a catalyst in rubber vulcanization. ANON. *Caoutchouc et gutta-percha* 15, 9464-6(1918).—A popular description of the use of this accelerator ( $p\text{-NO-C}_6\text{H}_4\text{NMe}_2$ ). For soft cured goods 0.5% is recommended, and 0.75% for ebonite. It is claimed that the finished product possesses greater durability than it would have when other catalysts are used.

JOHN B. TUTTLE.

Polymerization and oxidation of crude rubber. A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9478-82(1918).—A review of work done at Delft under Van Rossem (cf. C. A. 12, 2463).

JOHN B. TUTTLE.

The chemistry of vulcanization. D. F. TWISS. *Caoutchouc et gutta-percha* 15, 9484(1918).—A review, containing no new matter.

JOHN B. TUTTLE.

Aging of plantation rubber. II. HENRY P. STEVENS. *J. Soc. Chem. Ind.* 37, 340-21(1918).—A continuation of his work on a study of the aging properties of vulcanized rubber (cf. C. A. 13, 387). This series deals with smoked sheet, smoked slab, pale crepe and smoked crepe. The results of the previous expts. on ordinary sheets and slab rubber were confirmed, samples having the highest coeff. of vulcanization showing the most rapid deterioration. The max. tensile strength is secured only by overcuring, and such samples age quickly. There was practically no difference in behavior between the various kinds of rubber.

JOHN B. TUTTLE.

Rubber-producing weeds in Germany. H. E. PEARSON. *India Rubber World* 59, 201-2(1919).—A discussion of some rubber-bearing plants found in Germany including *Abrotylis gummifera* L., *Sonchus oleraceus* L., *Euphorbia cyparassias*, and others.

JOHN B. TUTTLE.

Specifications for pneumatic tires and tubes, adopted by the Motor Transport Corps (U. S. Army). ANON. *India Rubber World* 59, 16-22(1918).—Specification Nos. 1046, 1062, 1065, 1066, 1067, 1068, 1069, 1070, 1071 and 1072 for pneumatic tires and tubes.

JOHN B. TUTTLE.

Rubber laboratory organization. H. B. UNDERWOOD. *India Rubber World* 58, 534(1918).—U. suggests the following organization for a lab. connected with a rubber factory: (1) Testing of raw materials: *a*, rubber; *b*, fabric; *c*, compounding ingredients; (2) factory control; (3) development: *a*, new compds.; *b*, research; *c*, manufacturing processes; (4) commercial, *i. e.*, a study of competitors output.

JOHN B. TUTTLE.

Jar rings for cold-pack preserving. ANON. *India Rubber World* 58, 584(1918).—Specifications adopted by the U. S. Dept. of Agric., States Relations Service, Office of Extension Work North and West, for rubber jar rings. Methods for testing are given.

JOHN B. TUTTLE.

The absorption of water by vulcanized fiber and erinoid on exposure to moist air and the consequent change of electrical resistance. R. G. ALLEN. *Sci. Proc. Roy. Dublin Soc.* 15, 405-14(1918); cf. C. A. 12, 2497.—Plates of vulcanized fiber, red and blue erinoid,  $5.5 \times 5.95 \times 0.5$  cm. were exposed to air of satd. humidity for 400 hrs., when the fiber had absorbed 3.42 g., the red erinoid 1.43 g., and the blue erinoid 1.26 g. Comparable results were obtained with samples in the form of tubes. Tables are given showing the elec. resistance of the samples, and the effect of increased absorption of water at various temps.

JOHN B. TUTTLE.

**Colored rubber.** INDIA RUBBER CO. Brit. 120,824, Jan. 2, 1918. A sheet of rubber or rubber fabric is provided with pigment (*e. g.*, Al powder) in its outer layer only, the pigment being imbedded by vulcanization so as to produce a smooth, glossy surface. Thus, a sheet of vulcanizable rubber mixing may be sprinkled with a dry, powdered pigment without incorporation, and metal foil or other confining surface placed over the pigment preparatory to vulcanization. The rubber and foil may be superposed in a succession of layers, *e. g.*, by reeling into a compact roll, to facilitate handling. The product may be employed as a balloon or like fabric or as a wing, boat, or pontoon material for airplanes.

**Rubber compositions.** W. STROCKS. Brit. 121,136, Nov. 29, 1918. A mixt. of pure rubber, flour from waste vulcanized rubber, and S, with or without other ingredients, is used in making artificial leather, floorcloth, tires, etc. The mixt. of rubbers and S is calendered into sheets which are used as stock, which may be mixed with other materials such as pontianak, a clear, sticky gum, castor oil, ground fiber, white Pb, and dissolved resin. The products are vulcanized by a cold or hot process. Thin sheets of the material may be superimposed with the grain produced by rolling arranged alternately at right angles, and then compacted by pressure.

**Halogenating rubber.** S. J. PEACHEY. Brit. 121,091, Dec. 11, 1917. Alkyl, alkylene, alkenyl, and aryl halides, such as trichloroethylene and tetrachloroethane, are used as solvents in the making of halogenated rubber, gutta-percha, or balata according to the process described in 1,894, 1915 (*C. A.* 10, 1950), *i. e.*, treatment with Cl gas of rubber, dissolved in a solvent which does not react with Cl; also according to the process described in 121,194, in which  $\text{SO}_2\text{Cl}_2$  or a mixt. of Cl and Br or Br followed by Cl is used for the halogenation of rubber, gutta-percha, or balata.

**Plastic oxidation product of rubber.** W. O. SNELLING. U. S. 1,288,723, Dec. 24. A plastic material suitable for use in the manuf. of *chewing gum* is obtained by exposing thin sheets of Pontianak rubber, while moist, to the action of  $\text{O}_3$  for a few min. and then to the action of air for such time as required to impart the desired degree of plasticity. This treatment imparts to the materials a somewhat unpleasant taste, which is removed by washing successively with very dil. NaOH soln. and  $\text{H}_2\text{O}$ . A similar action on the rubber is effected by the use of alk. earth peroxides and HCl to generate  $\text{H}_2\text{O}_2$  in contact with the rubber.  $\text{BaO}_2$  may be used merely to initiate the action if desired, followed by treatment with  $\text{O}_3$ . Very weak  $\text{HNO}_3$  or nitrous fumes also may be used. The general properties of the product very closely resemble chicle. It may be mixed with turpentine to form a cement-waterproofing compn. The oxidation may be hastened by the use of catalysts such as oleic acid, salts of Cu and Fe (*e. g.*, Cu oleate), palm oil, Cu resinate or Mn resinate, which may be added to the amount of 0.5-1% of the wt. of the rubber. Cl effects an action on the rubber similar to that of  $\text{O}_3$ .

# CHEMICAL ABSTRACTS

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No. 7

## 1. APPARATUS.

L. C. JONES.

Laboratory apparatus for rapid evaporation. E. C. MERRILL AND CLARE OLIN EWING. *J. Ind. Eng. Chem.* 11, 230(1919); illus.—The app. has been found to be especially useful with solns. which are prone to decrepitate and for the drying of wool fibers used in *qual. color analysis*. By proper adjustment rapid evapn. at low temp. can be made. E. J. C.

Substitutes for platinum in electrolytic apparatus. PAUL NICOLARDOT AND JEAN BOUDET. *Bull. soc. chim.* 23, 387-91(1918).—Tests were made to det. the suitability for use as electrodes of alloys of Au and Pt containing from 12.5 to 25% of Pt. It was found that as cathodes they stood up very well, but as anodes they failed because of their loss in wt. during electrolysis in alk. solns. or in presence of sulfides and NaCN. The authors recommend for the cathode an alloy composed of Au, Ag and Cu in the proportions 920-50-30, and resistant to HNO<sub>3</sub>, H<sub>2</sub>S and O<sub>2</sub>, and for the anode the same alloy further protected from anodic oxidation by being electrolytically coated with a thin layer of Pt (0.005 g. per sq. cm.). J. L. WILEY.

An improved automatic buret. GEO. J. HOUGH. *J. Ind. Eng. Chem.* 11, 229 (1919); illus. E. J. C.

Limit of sensitiveness in the string galvanometer. I. K. A. WERTHEIM SALOMONSON. *Proc. Acad. Sci. Amsterdam* 21, 235-42(1918).—A discussion of the factors detg. the sensitiveness of an Einthoven string galvanometer. Al is the best material for measurement of small potential differences; a string 1  $\mu$  diam., 6.65 cm. long, completely relaxed, will give a deflection of 276 mm. for one microvolt, if the field strength be 997 gauss, and if the magnification be 1000 times. In a perfect vacuum the string would be critically damped. GEORGE W. MOREY.

Non-silverable containers for silvering mirrors. W. W. COBLENTZ. *Science* 49, 192-3(1919).—A further discussion. Cf. *C. A.* 12, 2263. E. H.

Some useful testing machines. H. S. PRIMROSE AND J. S. GLEN PRIMROSE. *Engineering* 106, 354-6, 385-8(1918).—The combined *tensile, crushing, and transverse bending machine* is operated by hydraulic pressure. Two fixed heads are mounted one above the other and a cradle is moved up and down between them by a yoke connected to a hydraulic plunger. A sep. device, connected into the pressure line between the pump and the plunger, measures the force by the displacement of a pendulum so that a pointer on a gage dial continuously indicates the force. Autographic records of the loading are also obtained from the pendulum. For standardizing, a thin-walled steel box filled with Hg is used. It carries a glass tube with a calibration mark, and a plunger actuated by a small micrometer screw. The Hg is adjusted to the mark in the glass tube, the load (either tension or compression) is applied, and the vol. change read off the micrometer after re-adjusting the Hg to the zero. A *torsion machine* is described in which the deforming couple is balanced by the displacement of a heavy pendulum. Here also the load is read and the autographic records are drawn from the

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pendulum displacement. Since this arrangement does not necessitate a rigid stationary head, the stationary head is arranged so that it is free to move along the axis of the machine. As the test piece shortens under torsion the stationary head moves and thus no tensile load is applied. The *Brinnell test* may be made in the compression machine described above. A loose collar rests on the test piece, and the motion past this collar of the plunger carrying the ball actuates a needle, so that the depth of the impression may be read directly from a dial. A similar arrangement is described for the Ludwik cone instead of the Brinnell ball. The above, together with a swinging hammer impact machine of no unusual features, are made by Amsler. A *Brinnell machine* is described in which the test piece rests on an anvil supported by a spring. The ball is run down into contact with the specimen by a screw with a friction nut which slips when contact is made. By moving a lever the spring under the anvil is compressed, forcing the specimen against the ball with a definite, known force. On releasing the pressure the ball is again run down into contact with the piece and the depth of the impression read off from graduations on the friction nut. Two forms of this machine are described—a small portable machine with a vertical yoke, and a larger horizontal machine with an opening large enough for 12-inch specimens. An *impact testing machine* consists of a heavy flywheel carrying the hammer in such a way that it can be brought into contact with the specimen when desired. The energy absorbed in breaking the specimen is detd. from tachometer readings before and after impact. These latter machines are designed by Guillery and made by Malicet and Blin, Aubervilliers, France. All the machines described have been used in British munitions plants. W. L. BADGER.

A practical oil circulating system for indirect heating. ANON. *Chem. Met. Eng.* 19, 733-5(1918).—Further description of the process mentioned in *C. A.* 12, 643. It is known as the "Merrill" system and the oil used is called "Meprolene." Typical applications are described. Advantages claimed over superheated steam are freedom from excessive pressures and leaks, with higher temp. of the circulating medium. The advantages over other oils is claimed to be freedom from decompn. or volatilization.

W. L. BADGER.

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A fusion bomb for sulfur determination in coal (PARR) 21.

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Oil-filtering apparatus. H. TEN WINKEL. U. S. 1,290,820, Jan. 7. The app. is adapted to sep.  $H_2O$  and other impurities from oil.

Specific-gravity bottle. A. T. HASSINGER U. S. 1,290,553, Jan. 7. A specific-gravity bottle (for detg. sp. gr. of liquids) is arranged with a thermometer and with a flexible bottom and a calibrated adjustment device for altering the position of the flexible bottom to vary the capacity of the bottle to compensate for temp. variations.

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## 2. GENERAL AND PHYSICAL CHEMISTRY.

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WILLIAM D. HARKINS AND E. B. MILLARD.

Science and the practical man. COSMO JOHNS. *Trans. Eng. Ceram. Soc.* 17, 372-8(1918).—A review of prominent scientific discoveries with notes on their later application. C. H. KERR.

The evolution of chemical symbols. I. W. D. HACKH. *J. Am. Pharm. Assoc.* 7, 1038-42(1918); cf. *C. A.* 12, 2313.—Historical discussion. L. E. WARREN.

Valence. WM. A. NOYES. *Science* 49, 175-82(1919).—An address. The development of the theory of valence is traced critically from its inception down to the modern ideas based upon the electron theory, and upon the consideration of + and -

atoms in org. compds. New expts. and ideas are as follows: Dry  $\text{NH}_3$  and  $\text{Cl}_2$  react forming  $\text{NCl}_3$ ; and a dry soln. of  $\text{NCl}_3$  reacts with dry  $\text{HCl}$  to form  $\text{NH}_4\text{Cl}$  and  $\text{Cl}_2$ . These facts seem to prove that  $\text{NCl}_3$  is formed by the addition of  $\text{Cl}_2$  to  $\text{NH}_3$  forming  $\text{NH}_3\text{Cl}^+\text{Cl}^-$ , followed by a splitting off of  $\text{HCl}$ , and a repetition of the process till all the H is gone. The decompn. of  $\text{NCl}_3$  by  $\text{HCl}$  is caused by the addition of the acid giving  $\text{NCl}_3\text{H}^+\text{Cl}^-$ , followed by the splitting off of a + and a — atom of Cl as free  $\text{Cl}_2$ . The analogy between these reactions and those which take place in the substitution of Cl for H in  $\text{CH}_4$  or  $\text{C}_6\text{H}_6$  recalls Michael's theory that addition compds. are first formed in such cases. The idea is advanced that such additions are always of two atoms or groups, one + and the other —; also, that atoms may form unstable compds. of higher valence when one of the new valences is + and the other —. The instability of such compds. is due to the fact that they contain two atoms or groups of opposite sign.

The formula  $\text{O} = \text{N} \equiv \text{N}$  is proposed for nitrous oxide rather than the usual  $\begin{array}{c} \text{N} \\ \parallel \\ \text{N} \end{array} \text{O}$ .

This structure takes account of the probability that one N atom remains + and the other — during the formation of  $\text{N}_2\text{O}$  from  $\text{NH}_4\text{NO}_3$ , and it also seems more in accord with the ease with which  $\text{N}_2\text{O}$  gives up its O.

R. H. LOMBARD.

The valence hypothesis of J. Stark. W. JACOBS. *Chem. Weekblad* 15, 1476–83, 1566–71 (1918).—An outline of Stark's theory of valence, with some of its applications.

GEORGE W. MORREY.

Kinetic theory of osmotic pressure and the Raoult Law. II. G. JÄGER. *Ann. Physik* 54, 463–80 (1918); *Sci. Abstracts* 21A, 308–9; cf. *C. A.* 7, 3866.—In his work on the osmotic kinetic theory of dil. solns., K. Jellinek has put forward various objections to the present author's interpretation of osmotic pressure and related phenomena. The author examines mathematically the general mechanism of osmotic pressure. He concludes that for the calcn. of the osmotic pressure the existence of the solvent can be ignored, while the dissolved substance may be regarded as existing in gaseous condition in the given vol. The internal pressure of a dil. soln. is investigated and an additional proof is given of the theorem that a dil. soln. must possess the same internal pressure as the pure solvent. The vapor tensions of dil. solns. are also examd.

D. MACRAE.

An indeterminateness in the interpretation of entropy as log W. MRS. T. EHRENFEST-AFANASSJEWA. *Proc. Acad. Sci. Amsterdam* 21, 53–7 (1918).—The ideas formed from purely combinatory reasoning do not form a satisfactory or conclusive foundation to direct our choice among many different standpoints to one in particular; the decision as to when the probability of the state of a system reaches a max. depends on the point of view of the investigator. Assuming a quantity of gas large enough to permit its division into a large number of parts, to each of which the laws of probability may be applied, log w for the whole is only equal to  $\Sigma \log w$  when the restriction, arbitrary from the point of view of combinatory reasoning, is made that in the parts only we consider all the possible permutations. If the whole system is regarded as a new object for combinations the probability of the distribution of a special state in the whole is not equal to the product of the probabilities of the parts corresponding to this state.

GEORGE W. MORREY.

Determination of the molecular complexity of liquid sulfur. ALEX. MITCHELL KELLAS. *J. Chem. Soc.* 113, 903–22 (1918).—The mol. complexity of liquid S was calcd. by the method of Ramsay and Shields from surface-tension measurements. At least 95% of the mobile S ( $\text{S}_x$ ) between  $115^\circ$  and  $160^\circ$  is found to have the formula  $\text{S}_8$ . At about  $160^\circ$  the reaction  $3\text{S}_8 = \text{S}_{18}$  appears to occur.  $\text{S}_{18}$  appears to be stable up to near the boiling point. The surface tension was measured by means of capillary

tubes at temps. between  $115^{\circ}$  and  $445^{\circ}$ . Trouble experienced on account of impurities ( $\text{SO}_2$ ,  $\text{SO}_3$ , and  $\text{H}_2\text{S}$ ) was overcome by distg. the S and boiling in dry N, the gases evolved being pumped off. In disagreement with the results obtained by other observers, the surface tension of S was found to fall continuously from the m. p. to the boiling point, being 48.2 dynes at  $280^{\circ}$  and 39.4 dynes at  $445^{\circ}$ . The density of liquid S was measured at 18 different temps. from  $115^{\circ}$  to  $445^{\circ}$  and was found to vary from 1.8084 at  $115.1^{\circ}$  to 1.6140 at  $445^{\circ}$ . If plotted against the temp. both surface tension and density show a "break" near  $160^{\circ}$ .  
D. MACRAE.

**Passivity of chromium.** A. H. W. ATEN. Amsterdam. *Proc. Acad. Sci. Amsterdam* 21, 138-50(1918).—The phenomena described in preceding papers (*C. A.* 12, 2266) are explained on the assumption that the potential of a Cr electrode in a soln. of a given Cr concn. is detd. by the density of the H charge. The various cases are discussed in detail, with the aid of a diagram in which the Cr potential is expressed as a function of the H concn.; the phenomena will depend on the H concn. in the Cr, large in electrolytic Cr, and on the rate of removal of the dissolved H from the Cr, or on the rate of evolution of H when anodically polarized.  
GEORGE W. MOREY.

**Course of the values of  $a$  and  $b$  for hydrogen at different temperatures and volumes.** III and IV. J. J. VAN LAAR. Fontanivent. *Proc. Acad. Sci. Amsterdam* 21, 2-15 (1918).—A continuation of *C. A.* 12, 2267.  
GEORGE W. MOREY.

**Variability with time of the distributions of emulsion particles.** L. S. ORNSTEIN. Utrecht. *Proc. Acad. Sci. Amsterdam* 21, 92-5(1918).—Mathematical.

GEORGE W. MOREY.

**The colors of colloids.** I. WILDER D. BANCROFT. *J. Phys. Chem.* 22, 601-30 (1918).—By means of a large number of quotations from standard works the author has laid the foundation for the discussion of the colors of colloids. Colors may be divided into two classes, pigmental and structural. The former are caused by the presence of a pigment that can be extd. by a suitable reagent, *e. g.*, the red color of a rose. Structural colors may be subdivided: (1) Those not dependent upon the presence of a pigment, *e. g.*, the white color of a lily, pulverized glass, gray hair, mother-of-pearl. (2) Those dependent upon the presence of a pigment, the color of which is modified by structure. Under this heading come, (a) objective structural colors such as blue and green feathers of birds; (b) subjective structural colors, those that vary with the angle of incidence of the light rays, *e. g.*, the brilliant flashing metallic tints of many birds.

E. B. SPEAR.

**Investigation on Pasteur's principle concerning the relation between molecular and crystallonomical dissymmetry.** V. Optically active complex salts of iridium-trioxalic acid. F. M. JAEGER. Groningen. *Proc. Acad. Sci. Amsterdam* 21, 203-14 (1918); cf. *C. A.* 12, 887.—Racemic  $\text{K}_3[\text{Ir}(\text{C}_2\text{O}_4)_3] \cdot 4\frac{1}{2}\text{H}_2\text{O}$  (completely isomorphous with the corresponding racemic Rh salt) was split into its optical components with strychnine; the rotation-dispersion of the strychnine salts of both *d*- and *l*-potassium iridium oxalate,  $[\text{Ir}(\text{C}_2\text{O}_4)_3](\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2)_3 \cdot 3\frac{1}{2}\text{H}_2\text{O}$  and  $3\text{H}_2\text{O}$ , resp., both pale yellow needles, are given in tables and curves. The *d*- and *l*-potassium iridium oxalate were also measured; both the *d*- and *l*-strychnine salts have a greater mol. rotation than the corresponding K salts. The rotation of iridium salts is greater than that of the corresponding Rh salts, and the slopes of the dispersion curves of the corresponding iridium and Rh salts are quite different, showing the preponderant influence of the central atom. Crystallographic details of *d*- $\text{K}_3[\text{Ir}(\text{C}_2\text{O}_4)_3] \cdot \text{H}_2\text{O}$ , large, orange-colored, flattened, triangular bipyramids, are given; it is completely isomorphous with the Rh salt.

**VI. Fission of potassium rhodium malonate into its optically active components.** F. M. JAEGER AND WM. THOMAS. Groningen. *Proc. Acad. Sci. Amsterdam* 21, 215-



24(1918).—Racemic  $K_3[Rh(C_6H_4O_4)_2]$  was converted to the Ba salt, then split with the aid of cinchonine sulfate; the *l*-compd. containing  $\frac{1}{2}H_2O$  crystallizes out first from soln., while the *d*-compd., which seps. later, contains  $3H_2O$ . From these the *d*- and *l*-K salts were prepd.; detailed crystallographic descriptions of each are given, with drawings of typical forms. Both show anomalous rotation-dispersion.

VII. Optically active salts of the triethylenediamine-chromic series. *Ibid* 21, 225-30(1918).—Racemic  $[Cr(Eine)_3]Ir_3.H_2O$  ("Eine" representing triethylenediamine radical) is perfectly isomorphous with the corresponding Co and Rh salts; typical crystals are described and drawn, and the mol. rotation-dispersions of the active components measured.

GEORGE W. MOREY.

The Brownian movement. L. S. ORNSTEIN. Utrecht. *Proc. Acad. Sci. Amsterdam* 21, 96-108(1918).—A derivation of Einstein's equation for the Brownian movement from statistical mechanics. Contrary to the objections of van der Waals, Jr., and Snethlage (*C. A.* 10, 2821), Einstein's equation is correct as long as  $\beta t$  ( $\beta = 6\pi\mu a/m$ ) is large in respect to  $1 - e^{-\beta t}$ ; in practice the lowest limit for  $t$  is 0.01 sec. Development of the equation of van der W. and S. leads to results in conflict with the statistical mechanics of Gibbs, the starting point of their reasoning.

The theory of the Brownian movement and statistical mechanics. L. S. ORNSTEIN AND F. ZEMKE. *Ibid* 108-14.—Further discussion of the paper of van der Waals and Snethlage.

GEORGE W. MOREY.

Remarks on the resistance capacity of a dipping electrode. A. MASSINK. *Jaarversl. Centr. Lab. Volksgezondh.* 1917, 58; *Chem. Weekblad* 15, 1365(1918).—An explanation of the erratic behavior of the electrode in question as reported in a previous paper (*C. A.* 12, 2480).

JULIAN F. SMITH.

Magnetic susceptibility and electric sensitivity. F. H. LORING. *Chem. News* 117, 229-31(1918); cf. *C. A.* 8, 1698.—It is proposed to treat magnetic susceptibility as a compound effect analogous to that of the joint resistance of two parallel circuits according to the well known rule  $R = r_1 r_2 / (r_1 + r_2)$ . In this way magnetic susceptibility is considered to be calculable from the elec. resistivity and "the at. or mol. currents expressed in terms of positive and negative resistivity." The terms "at. or mol. currents" and resistivity are used in a general sense, or by way of analogy, and these expressions must not be interpreted too literally, *e. g.*, mol. currents may stand for a resultant effect involving the orientations of electronic orbits but governed by mol. conditions. It follows from this method of treatment that ferromagnetic substances might have negative mol. currents associated with resistances numerically less than, but of the same order of magnitude as, the currents, while diamagnetic substances might have negative at. currents, the resistivities being numerically greater than the currents. For example, in the case of diamagnetic substances, if the effect of the negative at. currents are expressed by  $-a$  and that of the resistivity by  $b$ ,  $-a.b/(-a + b) =$  (negative susceptibility).

D. MACRAE.

Calculation, by the cyclic method of Leduc, of the ratio of principal specific heats of benzene and cyclohexane. G. DÉJARDIN. *Compt. rend.* 168, 161-4(1919).—The method of getting  $\gamma = C_p/C_v$ , which is not described here, depends on the use of a thermodynamic cycle in which the liquid is included. The results, believed good to 1%, are, for benzene,  $\gamma = 1.106$  at  $20^\circ$ ,  $1.116$  at  $100^\circ$ ; for cyclohexane,  $\gamma = 1.077$  from  $20^\circ$  to  $90^\circ$ . The value for benzene at  $80^\circ$  would hold for a system of 3 rigid spheres located at the vertices of a triangle, for cyclohexane, for a system of 3 solids differing slightly from solids of revolution. The value of these resemblances is not to be exaggerated, but the importance, for the study of the kinetic theory of gases, of a knowledge of  $\gamma$  for vapors seems to be indicated.

W. P. WHITE.

**Mercury as a contact poison.** G. BREIDIG. *Techn. Hochschule, Karlsruhe i. B. Ber.* 51, 1477(1918).—In connection with the statement of Paal and Hartmann that thus far, to their knowledge, nothing was known as to the influence of metallic Hg on the catalytic properties of the hydrosols of the Pt metals (*C. A.* 13, 447), B. points out that in 1899 he and von Berneck (*Z. physik. Chem.* 31, 327) observed a decrease in the catalytic activity (in the decompn. of  $H_2O_2$  in non-alk. soln.) of a Pt liquid which was shaken with metallic Hg before being used. CHAS. A. ROUILLER.

**La Société des Chimistes français.** H. LANDOWSKI. *Ann. chim. anal. chim. appl.* 1, 1-3(1919).—Le Syndicat central des Chimistes français, established in 1890, was reorganized Aug. 4, 1917, as la Société des Chimistes français, with the objects "of protecting and developing the consideration due to the profession of the chemist, of obtaining treatment compatible with the studies he makes and the function he exercises and of trying to realize in the bosom of one society, all of whose members are friends, the union of all French chemists." Beginning with Jan. 15, 1919, the organ of the society will be *Annales de chimie analytique et de chimie appliquée*, formerly *Annales de chimie analytique*, starting with 2nd series, Vol. 1. E. H.

**The Naval Consulting Board of the United States.** W. R. WHITNEY AND L. H. BAEKHLAND. Members of the Board. *J. Ind. Eng. Chem.* 11, 248-9(1919).—A "provisional statement, not involving details," regarding the Board and its work. E. J. C.

**Gases used in warfare.** D. D. BEROLZHEIMER. *J. Ind. Eng. Chem.* 11, 256 (1919).—The list of "gases" is accompanied with references to the standard reference books. A few journal references are given. E. J. C.

**Bibliography on carbonyl chloride (phosgene) and its derivatives.** D. D. BEROLZHEIMER. *J. Ind. Eng. Chem.* 11, 263-6(1919). E. J. C.

**Prompt action by chemists needed on prohibition legislation.** JAMES R. WITHROW. *J. Ind. Eng. Chem.* 11, 253-4(1919).—With the passage of the prohibition amendment two kinds of chem. responsibility present themselves. "The first responsibility is that of watchful care over both national and state legislation so that those in charge of this legislation may be supplied with honest information which will prevent its lack bringing unnecessary hardship upon chemistry and those utilizing it, by unwise restrictions. The other responsibility is involved in the importance of every chemist eliminating, as rapidly as may be, the need for undenatured alcohol in every laboratory and manufacturing operation." E. J. C.

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**The crystal structure of gray tin (BIJL, KOLKMEIJER) 9.**

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TRAFTON, GILBERT H.: *Science of Home and Community: A Textbook of General Science*. New York: The Macmillan Co.

WOODS, HUGH: *On the Nature of Things*. New York: William Wood & Co. 248 pp. \$2.50. For review see *J. Am. Med. Assoc.* 72, 597.

WILLOWS, R. S. AND HATSCHKE, E.: *Surface Tension and Surface Energy and their Influence on Chemical Phenomena*. 2nd Ed. London: J. and A. Churchill. 115 pp. 4s. 6d. Cf. *C. A.* 9, 2836.

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

The problem of radioactive lead. THEO. W. RICHARDS. Harvard Univ. *Science* 49, 1-11(1919).—Presidential address, Am. Assoc. Adv. Sci. G. L. WENDT.

The conception of the chemical element as enlarged by the study of radioactive change. FREDERICK SODDY. *Nature* 102, 356-8(1919).—A discourse.

W. H. ROSS.

Ionization of mercury, sodium and potassium vapors and the production of low voltage arcs in these vapors. T. C. HEBB. *Phys. Rev.* 12, 482-90(1918); cf. *C. A.* 12, 1530.—The expts. prove that in the case of K and probably of Na ionization can occur at a voltage  $V$  given by the equation  $V_e = h\nu$ , where  $\nu$  is the frequency of the first member of the principal series of the element. These elements thus fall in line with Hg and more or less with the cases of H and He. It appears that ionization at the resonance voltage was due either to repeated collisions or to a combination of collision and photoelec. effect, but that in either case a minimum velocity of collision was necessary, this min. velocity corresponding to the resonant voltage. K vapor can be ionized at 1.6 v., its resonant voltage, while Na vapor can be ionized at 2.5 v., which is very close to its resonant voltage. The D lines of Na can be excited at less than 1.0 v. These results are in agreement with those of Wood and Okano (*C. A.* 11, 3163). The Na and K arcs in Hg vapor can operate below their resonance potentials and as low as 1.4 v. for Na and 0.5 v. for K. The Hg spectrum can be produced as low as 0.5 v. in an atm. of Hg and K.

A. L. FIELD.

The physical characteristics of X-ray fluorescent intensifying screens. MILLARD B. HODGSON. *Phys. Rev.* 12, 431-5(1918).—Lately the fluorescent screen has been employed to reduce the lengthy exposures of such X-ray spectroscopic investigations as are dependent on the photographic plate for record. Of the materials which fluoresce to X-rays in the range of frequencies from the ultraviolet to the red, there are only a few which can be used efficiently for photographic intensification. Of these, crystalline  $\text{CaWO}_4$  is by far the best. The efficiency of any radiator as a source of photographic stimulation depends primarily on the comparative spectral distribution of the energy of the radiator and the spectral sensibility of the particular photographic plate used. Photographs are given of the fluorescent spectra of  $\text{CaWO}_4$  obtained by a quartz spec-

trograph on an X-ray plate, a fast ordinary plate, an orthochromatic plate, and a panchromatic plate. In addition, photographs are given which show the spectral sensitivities to white light of the same plates. The fluorescence is certainly dependent primarily on the following factors: (1) selective absorption of the elements of the crystal compd. in the intensifying screen, (2) the frequency of the exciting radiation, and (3) the crystal structure of the  $\text{CaWO}_4$  used. The X-ray analysis of the latter will probably throw light on the subject. H. also finds that the characteristic radiations from metal screens, especially of Ag and Pt, are of practical value photographically.

A. L. FIELD.

Radioactive minerals in South Africa (ROGERS) 8.

CURIE, MME. P., *et al.*: Les progrès de la physique moléculaire. Paris: Gauthier-Villars et Cie. 243 pp. 12 francs.

SILBERSTEIN, LUDWIK: Elements of the Electromagnetic Theory of Light. London: Longmans, Green & Co. 48 pp. For review see *Am. J. Sci.* 47, 140(1919).

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

Distribution of water power resources in the United States. O. C. MERRILL. *Elec. World* 73, 370(1919).—Sixty % of the total water power resources are centered in Cal., Ore., Wash., Idaho and Montana.

C. F. G.

Hydroelectric power in Ontario. ANON. *Electrician* 82, 159(1919).—The estd. total for the River St. Lawrence is 1,800,000 low water continuous h. p. on the Canadian side. At Niagara Falls the total power generated on the U. S. side is 265,000 h. p. and on the Canadian side 388,500 h. p., used almost altogether for electrochem. and electrothermal purposes. Further details are given.

C. G. F.

Progress in electric steel. ANON. *Iron Age* 103, 571-2(1919).—A review.

C. G. F.

Electric smelting of iron ores in British Columbia. ALFRED STANSFIELD. *Eng. Mining J.* 107, 224(1919).—Estd. consumption of power is 0.4 to 0.5 h. p. yr. per ton of Fe produced. The total cost of production per ton of pig iron for a plant consisting of 3 elec. furnaces, each of 3000 kw., is given as \$29.75.

H. JERMAIN CREIGHTON.

Polarization of Leclanché cell (and Weston cell). F. E. HACKETT AND R. J. FREELY. *Sci. Proc. Roy. Dublin Soc.* 15, 279-88(1918).—Due to polarization it is difficult to attain precise measurement of the internal resistance of the Leclanché dry cell. The authors found that the recovery of the cell after polarization follows the law for the velocity of bimolecular reactions obeyed by the ionization of gases. A Leclanché cell was connected in series with a resistance so adjusted that the initial current was 0.2 amp. Voltage readings were made every 10 min. The curves for the increase in polarization varied from test to test; on the other hand, the recovery curves were practically the same for all tests. Accordingly, attention was confined to the recovery curves, of which 30 in all were plotted. In the first ten min. the recovery voltage rose from 0.63 to 1.43, in another 60 min. to 1.47, and after 30 hrs. to 1.50 v. The process in the first 10 min. is probably due to an excess of + ions accumulated on the surface of the C electrode during polarization. The second or slow part of the recovery curve is due to diffusion, *i. e.*, the gradual elimination of concn. differences in the electrolyte which were brought about during polarization. If  $V$  represents the voltage at any time during the first rapid recovery stage,  $V_1^*$  that at the end of this first stage, and  $a$

a constant, then the velocity of the recovery can be expressed by the bimolecular equation  $dv/dt = \alpha(V_s - V)^2$ . In the case of the cell tested  $V_s$  was found to be equal to 1.32 volts and  $\alpha = 0.694$ . The agreement between observed and calcd. values is very good. Tests were also made on a Weston cell and the above equation was found to apply. Accordingly it seems probable that the equation is applicable to various types of polarized electrodes. C. G. F.

**Storage batteries.** O. W. A. OETTING. *J. Cleveland Eng. Soc.* 11, 95-102(1918).—Recent developments commercially are toward small units, i. e., isolated lighting units, automobile batteries and batteries for war purposes. No types have been developed using plates other than the Pb or the Ni-Fe elements. All changes were along lines of construction details and method of mixing pastes. 32-v. systems have been adopted as standard for isolated battery plants. Applications to auto starter service brought about high rates of discharge previously considered next to impossible with proper life. Normally an elec. starting motor draws current at a rate that will discharge the battery (i. e., lower voltage to about 1.5 v. per cell) in about 15 min. The Soc. of Automotive Eng. have standardized two rates for testing. One is to det. the lighting ability and calls for a discharge at normal temps. of 5 amps. The second rate is detd. by discharging at such a rate that the battery is discharged in 20 min. Its purpose is to det. the starting ability of a battery. By the term "five second voltage" is meant the voltage at the end of 5 secs. at a certain discharge rate, often 4 or 5 times the so-called 20-min. rate. The five-second voltages are used in detg. the proper size of battery needed for starting the engine, and also in designing the elec. starter. The factor that det. the size is mainly the power required to start the engine under cold weather conditions. At low temps. the battery capacity and thermal voltage are considerably reduced. The Fe-Ni alk. battery has not been applied to elec. starters, due to its high internal resistance, and its poor performance at low temps. At  $-12^\circ$  the Pb acid type has about 50% of its normal capacity, while the Fe-Ni battery is below 10%. Deterioration of Pb plates is largely due to overheating in summer time. A Pb battery will normally discharge itself on open circuit in about 100 days. Freezing of battery electrolyte can be avoided by keeping the cells fully charged, since in this condition the freezing temp. is about  $-60^\circ$ . A. L. FEILD.

**Removal of sediment from storage cells.** M. W. PULLEN AND F. F. SKRIVAN. *Elec. World* 73, 432(1919).—When cells cannot be dismantled for cleaning, deposits of active material collected at the bottom of cells can be removed by inserting a glass tube into the cell and drawing up the deposit with the aid of a filter pump and large bottle trap. One illustration. C. G. F.

**Pointers for the plater when buying equipment.** E. P. LATER. *Foundry* 47, 76-8(1919).—A discussion of the features to be considered when selecting the proper machines; the lining and use of tanks; the flow of electricity; and voltage regulation.

H. JERMAIN CREIGHTON.

**The deleterious effect of using saline oil coke in the manufacture of carbon electrodes.** H. SCRAGG. *J. Soc. Chem. Ind.* 37, 1237(1918).—Saline oil coke from Russia contains from 6 to 7% NaCl. It is possible that during calcination a loss of NaCl will occur. The presence of salt, however, seems to prevent as high a temp. being attained during calcination as is the case with saline-free coke, the temp. being reduced from 1100-1500° to 880-1100°. Thus the volatile NaCl would condense on the cooler coke at the top or drop back into the furnace. Instead of a loss, a process of concn. would go on until the furnace was drawn. In practice, it is found that the NaCl increased from 6% in the original to 8% in the calcined coke, and the insol. ash rose from 0.8 to 1.2%, the latter being probably due to the action of fused NaCl on the furnace lining. The density of the finished electrode should be at least 2.00, whereas with oil

coke containing 1.78% NaCl the density was 1.89. The low density must be due to (1) low temp. of calcining, (2) improper baking temp., or (3) to the NaCl preventing the escape of volatile matter. Many of the finished electrodes are blistered and have whitish marks on the surface. A. L. FIELD.

**The Davis oven for baking electrodes.** ANON. *J. four élec.* 28, 11-2 (1919).—The heating chamber of a Davis furnace measures 2.75 m. in width, 1.83 m. in length, and 2.75 m. in height, and can contain 6 electrodes having a diameter as large as 560 mm. The refractory lining of the furnace is of Scotch brick, the walls being 230 mm. in thickness. The top of the furnace is so constructed that it preheats the air used in the six gas burners by which the baking oven is indirectly heated. Each of these burners is connected with a gas and an air supply. By dividing the baking oven, it is possible to bake simultaneously electrodes at two different temps. The electrodes are held in the oven in a vertical position by holders of refractory material, and are maintained at a uniform temp. for several days. The max. variation in temp. is 50-60°. When employed in elec. steel furnaces, the consumption of electrodes baked in the Davis oven amounts to 5 kg. per ton of steel. H. JERMAIN CREIGHTON.

Status of nitrogen fixation (WHITE) 18. British Admiralty hydrogen gas plant (ANON.) 18.

CROWTHER, J. A.: *The Life and Discoveries of Michael Faraday*. New York: The Macmillan Co. 71 pp. \$1.00.

EDGCUMBE, KENELM: *Industrial Electrical Measuring Instruments*. 2nd Ed. Revized and enlarged. London: Constable & Co., Ltd.

SOUBRIER, MAURICE: *Les industries électriques d'hier et de demain. L'enseignement de l'électricité industrielle*. Paris: H. Dunod et E. Pinat. 214 pp. 12 francs. For review see *Bull. soc. d'encour.* 130, 503.

**Storage battery.** B. FORD. U. S. 1,289,146, Dec. 31. Structural features.

**Storage battery.** E. F. ANDREAE. U. S. 1,289,354-5-6, Dec. 31. Structural features.

**Storage battery.** M. MELIA. U. S. 1,290,487, Jan. 7. Structural features.

**Electric battery.** R. C. BENNER and H. F. FRENCH. U. S. 1,289,365, Dec. 31. Negative battery elements, for use with NaOH or other alk. electrolyte, are formed of Cu oxide with a binder of S. This prevents sifting out of the oxide when placed in perforated containers. The S is heated sufficiently to cause it to cement together the particles of oxide and may be used in amounts of from 0.5% to 40%. Its use also improves the electrochemical properties of the battery, giving high voltage and long life. Cf. C. A. 12, 882.

**Electric battery.** R. C. BENNER and H. F. FRENCH. U. S. 1,289,366, Dec. 31. In the manuf. of Cu oxide elements for elec. batteries with an alk. electrolyte such as KOH or NaOH, the Cu oxide is mixed with sufficient Se or Te to cement the particles of Cu oxide together. This bonding of the oxide particles prevents sifting out from perforated containers and also permits the molding of the electrode material into solid blocks if desired for use without perforated containers. Selenides or tellurides may also be used. Use of either Se or Te or their compds. has the effect of raising the voltage of the battery.

**Electric battery.** H. F. FRENCH. U. S. 1,289,433, Dec. 31. The pat. relates to structural features of a battery of the dry cell type.

**Electric battery.** W. C. BAUER. U. S. 1,289,609, Dec. 31. Elec. batteries are formed with an alkali metal hydroxide electrolyte, a Zn anode and a cathode comprizing  $\text{PbO}_2$  together with a chemical such as  $\text{Na}_2\text{S}$  or  $\text{NaOCl}$ , which will ppt. from the electrolyte the sol. Pb compds. which may form in it.

**Photosensitive electrical cells.** S. A. BERGLUND. U. S. 1,289,369, Dec. 31. The capacity of Se cells or other photo-sensitive cells is increased, and overheating of the cell avoided, by absorbing heat, as generated, from the cell during its operation.  $\text{H}_2\text{O}$ , air,  $\text{CO}_2$  or other heat-absorbing media may be used for abstracting the heat from the cell.

**Electrolytic cell and electrode therefor.** A. T. STUART. Can. 188,772, Feb. 18, 1919. The electrode has a rigid back and thin blades arranged at an angle to the back and spaced from one another, the blades engaging the back for the full length of the blades. The spaces between the blades are of the same width for the entire length of the blades.

**Manganese dioxide depolarizer for electric batteries.** C. ELLIS. U. S. 1,289,707, Dec. 31.  $\text{MnSO}_4$  or other Mn salt is dissolved and the soln. heated to the b. p. while Cl is introduced into it. Black  $\text{MnO}_2$  or some similar higher oxide of Mn forms and is pptd. and from time to time removed by filtration. As the soln. increases in acidity, the excess acid formed is neutralized. The acidity is not allowed to exceed 10%, but 2-5% acid may be present with formation of a deep black  $\text{MnO}_2$  which is adapted for use as a depolarizing material for batteries and does not cause local action in the battery when so used. Spent battery depolarizer material may be used in the process by dissolving it in acid and treating the soln. with Cl.  $\text{Na}_2\text{SO}_4$  or NaCl may be added to the Mn salt soln. to raise the b. p. so that the temp. of pptn. may be higher but usually this is not desirable, as it tends to cause the formation of complex manganites.

**Electric melting furnaces.** J. D. SHIPRON. Can. 188,727, Feb. 18, 1919. The electrodes project inwardly through the opposite walls of the melting chamber and a block of refractory conducting material insulated from the walls of the furnace is supported above the ends of each pair of electrodes.

**Electric furnace for alloying metals.** F. L. MCGAHAN. U. S. 1,290,268, Jan. 7. The furnace is especially adapted for smelting Fe ore and making alloy steels.

**Electric arc furnace for gas reactions.** A. V. LIPINSKI. U. S. 1,290,600, Jan. 7. The app. is especially adapted for making oxides of N or for the production of HCN, or for other reactions in which it is desirable that the gaseous products be cooled immediately after contact with the arc. A dispersed arc is produced against equidistant electrodes so that a flame sheet is formed bounded by the electrodes and cooling gas is supplied at different points of the flame sheet to maintain a supporting gas wall for the flame over its entire surface. Reacting gases are supplied to the other side of the flame and the reaction products are withdrawn from the flame at different points.

**Tungsten-reducing furnace.** C. A. PFANSTIEHL. U. S. 1,289,896, Dec. 31. The pat. relates to structural features of a tubular furnace for reducing  $\text{WO}_3$  in which the latter is drawn successively through independently heated sections of the furnace.

**Alumina from raw materials containing iron.** R. H. MCKEE. U. S. 1,290,269, Jan. 7. The process is designed to produce practically pure alumina from impure materials such as natural deposits of basic Al sulfate or the acid-sol. furnace residues remaining after the extn. of K from feldspars, sericite or other K-bearing silicates of Al. The raw material is ground and treated with  $\text{H}_2\text{SO}_4$  and is then subjected to a fractional electrolytic purification for the purpose of eliminating most of the Fe as hydroxide without pptg.  $\text{Al}(\text{OH})_3$ . The purified soln. is filtered off and allowed to flow through an electrolytic diaphragm cell in which the conditions are so regulated as to

effect as complete a pptn. of  $\text{Al}(\text{OH})_3$  as possible. Good results are obtained with a cathode current d. of about 1 amp. per sq. dm. and an anode d. of 0.3 amp. per sq. dm. or less, a voltage of about 6 and temp. of 20–50° (pptn. being somewhat better at the lower temps.)

Oxide coating on aluminium. P. MACGAHAN. U. S. 1,289,215, Dec. 31. In printing on Al, for production of clock dials, etc., the sheet Al is immersed in a soln. of a sol. silicate and subjected to the action of an elec. current to form an integral oxide coating on the metal, and, after washing and drying, the desired characters are printed on the oxidized surface thus formed.

Oxides of nitrogen from atmospheric air. J. L. LA COUR. U. S. 1,290,584, Jan. 7. In producing oxides of N from atm. air by passing a vol. of gas containing O and N repeatedly through an elec. arc in circuit, a leakage of air into the system is permitted and there is maintained in the circuit a % of O greater than that required for the reaction. During the circulation of the gases, there is removed from the circuit a gas mixt. rich in O and after sepn. from associated impurities the O is returned to the system. This mode of handling the gases obviates the need for a gas-tight furnace and prevents difficulties which might otherwise follow from the leakage of air into the circuit and the consequent accumulation of argon and other undesired gases in the app.

Separation of suspended particles from gases. H. A. BURNS. Can. 188,877, Feb. 25, 1919. Gases are passed through an elec. field in which a unidirectional discharge is maintained and a stream of fluid is interposed in the path of the charged particles and maintained on the surface of the pipes or collecting electrodes. App. is also specified.

Arc lamp electrodes. W. R. MORR. U. S. 1,289,514, Dec. 31. Rare-earth metals of the Yt group are used in flaming arc lamp electrodes with a C shell or body for the obtainment of a bright red light of high candle power which is especially due to the Yt. A HCl soln. of various rare earth metal compds. is satd. with  $\text{Na}_2\text{SO}_4$  or  $\text{K}_2\text{SO}_4$  at a temp. of 50–60° and allowed to stand to effect sepn. of Ce and other undesired rare earths, while leaving Yt in soln. The Yt material thus obtained is mixed with 30–60% of C and cored in C shells with a binder such as an alkali metal silicate, glucose or tar and benzene.  $\text{CaF}_2$  may be used together with the Yt and other rare earth compds. but the Yt compds. should exceed a 1:2 ratio with the other rare earths. For color photography and pan-chromatic photography, the crude Yt group of the Welsbach residue may be used in mixts. with  $\text{CaF}_2$ , SrF<sub>2</sub>, rare earth titanates and other compds. to secure the exact color effects desired without using a color screen or with only a very light color screen. The Yt compds. color the arc green when the arc springs from the Yt compds. themselves but produce a brilliant red coloration when the arc springs from C containing Yt. The best compds. of Yt for the purpose are  $\text{Yt}_2\text{O}_3$ ,  $\text{YtF}_3$ , or the mineral yttriofluorite. Metallic Yt also may be used. The Yt group compds. can also be added to solid flame carbons in which case they are mixed with C flour and a binder such as pitch, molded and baked in the usual way. The flaming material, consisting of Yt compds. and  $\text{CaF}_2$ , in such a carbon should constitute 20–60% of the entire electrode mass, the  $\text{CaF}_2$  constituting 0–50% of the mass.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Water of hydration. IV. Compounds with 2  $\text{H}_2\text{O}$  and 3  $\text{H}_2\text{O}$ . I. GUARESCHI. R. Univ., Torino. *Atti accad. sci. Torino* 53, 861–8; cf. C. A. 11, 3002.—The minimum temp. at which dehydration occurs, and the rate at which  $\text{H}_2\text{O}$  of hydration is lost,



have been detd. for the following salts:  $Sr(CHO_2)_2 \cdot 2H_2O$ : At  $30^\circ$ , which is the dehydration temp.,  $1 H_2O$  was lost in 40 hrs.,  $\frac{1}{2} H_2O$  in 48 hrs. more, and the final  $\frac{1}{2} H_2O$  after another 92 hrs. Under 20 mm. pressure over  $H_2SO_4$  at ordinary temp.,  $1 H_2O$  was lost after 70 hrs.,  $\frac{1}{2} H_2O$  after 25 hrs., and the last  $\frac{1}{2} H_2O$  only after another 120 hrs.  $H_2O$  of hydration is not regained on standing in air.  $Zn(CHO_2)_2 \cdot 2H_2O$ : Stable in air. At the dehydration temp.,  $70^\circ$ ,  $1 H_2O$  was lost after 24 hrs., and the second  $H_2O$  after another 40 hrs. At  $100^\circ$  all the  $H_2O$  is lost in 3-4 hrs. The anhydrous salt absorbs about  $1\frac{1}{2} H_2O$  upon standing in the air.  $Mn(CHO_2)_2 \cdot 2H_2O$ : The dehydration temp. is  $70^\circ$ , at which  $1 H_2O$  was lost in 74 hrs.,  $\frac{1}{2} H_2O$  after 46 hrs. more, and the final  $\frac{1}{2} H_2O$  only after another 168 hrs. The salt is stable in a desiccator over  $CaCl_2$  and  $H_2SO_4$ , and under 10 mm. pressure. The anhydrous salt regains its  $2 H_2O$  on long standing in air.  $Ca(ClO_3)_2 \cdot 2H_2O$ : The dehydration temp. is  $50^\circ$ . The dry salt regains its  $H_2O$  rapidly when exposed to air and is very deliquescent.  $K_4Fe(CN)_6 \cdot 6H_2O$ : The dehydration temp. is  $50^\circ$  in a thermostat,  $42^\circ$  in a current of air, and room temp. over  $CaCl_2$ . The last  $\frac{1}{2} H_2O$  is lost very slowly. In fact, in many of the above salts  $H_2O$  seems to be given off in fractions of mols., and the last  $\frac{1}{2} H_2O$  is given off much more slowly than the preceding  $H_2O$  mols. Since it is unlikely that  $\frac{1}{2}$  mol of  $H_2O$  actually exist, it is considered probable that metallic salts have a mol. wt. greater than that represented by their simple formulas. For example, the formulas  $Mn_3(CHO_3)_4 \cdot H_2O \cdot H_2O \cdot 2H_2O$  and  $Sr_3(CHO_3)_4 \cdot H_2O \cdot H_2O \cdot 2H_2O$  would permit of the  $H_2O$  being given off as whole mols., and at the rates observed above.

R. H. LOMBARD.

Bibliography on carbonyl chloride and its derivatives (BEROLZHEIMER) 2. The action of organic acids on metals (FOUW) 9.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Approximate atomic weights for use in chemical analysis. N. SCHOORL. *Z. anal. Chem.* 57, 209-25 (1918).—See *C. A.* 12, 1625. JULIAN F. SMITH.

A method for determining the composition of a mixture of similar salts of two metals, without separating the mixture into its constituents. H. N. WILSON. *Chem. News* 118, 3-4 (1919).—The method is based on the detn. of the common anion and calcn. of the amts. of the 2 salts present, e. g.,  $NaCl$  contains 60.65%  $Cl$ ,  $KCl$ , 47.55%, so that 0.00%  $NaCl$  and 100%  $NaCl$  are the limits of a mixt. of the two salts (or 60.65 and 47.55%  $Cl$ , respectively); while the % of  $Cl$  rises 13.098%, the %  $NaCl$  rises 100, so when the %  $Cl$  rises 1.00 the %  $NaCl$  rises 100.00/13.098 or 7.6346; therefore det. the %  $Cl$  in a mixt. of the chlorides (free from impurity), subtract the minimum possible %  $Cl$  (47.55) in the mixt. from the % found and multiply the result by 7.6346, obtaining %  $NaCl$  present;  $KCl$  is obtained by difference. W. suggests the method for the detn. of total alkali in flue dust. The method may be applied to other cases, e. g., detn. of  $Ba$  in a mixt. of  $CaCO_3$  and  $BaCO_3$ , the results being calcd. from the %  $CO_3$  found. F. W. SMITHER.

Volumetric determination of barium. THOS. STEEL. *Analyst* 44, 29 (1919).—In connection with Waddell's paper (*C. A.* 12, 2175) S. suggests washing the ppt. with  $H_2O$  satd. with  $BaCrO_4$ . This serves better than correcting for soly. in  $H_2O$ .

ERLE M. BILLINGS.

A physico-chemical method of determining alkali carbonates in the presence of alkali hydroxides. Application to the analysis of flue gases. RENÉ DUBRISAY,

TRIPPIER AND TOQUET. *Compt. rend.* 168, 56-9(1919).—The method is based on the diminution of the coeff. of reciprocal miscibility of  $H_2O$  and  $PhOH$  by alkali carbonates. The authors prepd. solns. of  $Na_2CO_3$  and  $NaOH$  (2 *N* to 0.25 *N*), united those of same normality, and mixed 50 cc. aliquots with 50 g. of  $PhOH$ ; the mixts were heated until complete soln. resulted, then let cool and the temp. was noted at which turbidity appeared, following the method of Rothmund (cf. *C. A.* 2, 2476). From the data obtained curves were plotted, the abscissas showing the %  $Na_2CO_3$  and the ordinates the temp. To apply the method to an unknown mixt., det. the total alkali by titration, make up to a suitable concn. (e. g., 40 g. per l.), mix 50 cc. with 50 g. of  $PhOH$ , and proceed as above. From the turbidity temp. found and the appropriate curve (in this case *N*), the %  $Na_2CO_3$  is noted. The turbidity point can be easily detd. to 0.1°. To det.  $CO_2$  in flue gases bubble 1 l. of the gas (requires about 30 min.) through 71.5 cc. of 0.25 *N*  $NaOH$  soln., det. the % of  $Na_2CO_3$  by the above method. using a curve plotted for 0.25 *N* solns., and calc. the %  $CO_2$ . Results are reported showing excellent agreement with those obtained by direct analysis. Cf. Chopin, *C. A.* 13, 67. F. W. SMITHER.

A critical study of the Ledebur method for determining oxygen in iron and steel. J. R. CAIN AND EARL PETTIJOHN. *Bur. Standards, Tech. Paper* 118, 33 pp.(1919).—An exptl. study reported in detail. Errors in the method and their remedies are discussed. Special methods for prepg. samples are given and new forms of app. are described. The metallurgical significance of the results obtained by the L. method is pointed out. It is shown that: "(1) The L. method requires extraordinary precautions to obtain reliable results. The errors described undoubtedly affect in greater or less degree nearly all results by this method that have been described in the literature, and if these are approximately correct, it is because of compensating errors; (2) the L. method as described detns. with certainty only oxides of Fe, Mn above  $MnO$ , and Ni, Cu, and W, if the latter 3 ever exist in steel. In turn, such oxides are detd. correctly only in case they exist in the metal uncombined as silicates, which probably seldom happens; (3) L. O detns. show no distinguishing features for acid Bessemer, basic or acid open-hearth, duplex, elec. furnace, or crucible steel (American manuf.); (4) L. O detns. show no differences in steels deoxidized with a variety of deoxidizers. In view of these facts we believe that the method is of little practical value, and that it must be superseded by others which are more positive and more specific in the information they yield."

F. W. SMITHER.

Tentative methods for chemical analysis of alloys of lead, tin, antimony and copper. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 502-9(1918).—Methods compiled from the literature are given in detail and include: (1) a general method (cf. Thomson, *J. Soc. Chem. Ind.* 15, 179(1896)); (2) rapid volumetric procedure for factory control (molybdate method for Pb; Pearce-Low I method for Sn;  $KMnO_4$  method for Sb; pptn. of Cu as  $CuCNS$  with ignition and soln., completing by the KCN or  $KI-Na_2S_2O_3$  methods).

F. W. SMITHER.

Tentative methods for chemical analysis of manganese bronze. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 510-22(1918).—Methods compiled from the literature are given for the detn. of: Cu and Pb electrolytically, Pb as  $PbSO_4$ , Sn by weighing as  $SnO_2$ , Fe by  $KMnO_4$ , Mn by  $(NH_4)_2S_2O_8$  and Na bismuthate.

F. W. SMITHER.

Tentative methods for chemical analysis of gun metal. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 523-37(1918).—Methods compiled from the literature are described in detail and include the following detns.: Cu (electrolytically), Sn (in the presence and absence of P), Pb (electrolytically and as  $PbSO_4$ ), Zn (by weighing as  $ZnSO_4$ ), P (alkalimetrically and by  $KMnO_4$ ).

F. W. SMITHER.

The evaluation of zinc dust: a proposed method of analysis. L. A. WILSON. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 220-34 (1918).—See C. A. 13, 14.

F. W. SMITHER.

The determination of carbon dioxide in carbonates. DONALD D. VAN SLYKE. Rockefeller Inst. *J. Biol. Chem.* 36, 351-4 (1918).—The method is applicable to all carbonates, sol. and insol., in the absence of acids, such as  $H_2S$ , that are highly volatile from  $H_2O$  soln. It was devised primarily for the detn. of carbonate in bones which had been dried and pulverized but not ashed. Place the carbonate, either pulverized or in soln., in the bottom of a tube 20-25 mm. in diam. and place the tube in a 250 cc. suction flask (Fig.), containing an excess of 0.1 N  $Ba(OH)_2$  soln. When using a pulverized carbonate, weigh the tube, slip into it a roll of glazed paper to protect the walls, pour in the substance and reweigh the tube after withdrawing the paper. Evacuate the flask to a pressure of 50 mm. or less and close the outlet with the screw clasp. Admit an excess of N HCl, usually about 5 cc., slowly from the dropping funnel, leaving some of the acid above the stopper to insure its remaining air-tight. After the rapid evolution of  $CO_2$  has ceased, agitate the solns. with a rotary motion for 3 min. completely to transfer the  $CO_2$  from the inner tube to the  $Ba(OH)_2$  soln. Release the vacuum and remove the  $BaCO_3$  by filtration through a Gooch crucible, rinsing the flask and crucible with 3 portions of about 20 cc. each of  $H_2O$ . Titrate the filtrate with 0.1 N HCl, using phenolphthalein as indicator. In the analysis of dried pulverized bones which have not been ashed, 5 hrs. should be allowed for the acid to penetrate into the particles which are permeated with fat and protein; the solns. are stirred occasionally by rotation during that period and for 3 min. at the end of it. The fact that the entire process is carried out in a single closed vessel practically excludes error from the loss of  $CO_2$ .



A. P. LOTHROP.

Estimation of small quantities of ether in alcohol. H. E. Cox. *Analyst* 44, 26-7 (1919).—For very small quantities the methods of Fleischer and Frank (C. A. 1, 2912) and Wolff (C. A. 5, 561) are not satisfactory. Exptl. errors are large when density detns. are used, although the latter give fair results. A slight decrease in vol. is observed when equal vols. of  $Et_2O$  and  $EtOH$  are mixed. This amounts to about 0.5% of the total vol. "The presence of 0.25%  $H_2O$  will mask the effect of 1% of  $Et_2O$ ; and as 100%  $EtOH$  is very rarely met with, it is not sufficient merely to det. the density and refer to a table.  $EtOH$  of 99% and upwards distils over unchanged under ordinary conditions; any  $Et_2O$  it contains passes over in the first fractions and no const. boiling mixt. is formed. The density of the  $EtOH$  is taken as that obtained after the removal of the  $Et_2O$  (by distn.)." The expression  $[D(EtOH) - D(mixt.)]/0.0007 = \text{amt. of } Et_2O \text{ is used}$ . The Perkin type of pycnometer with glass caps was used for density detns. When distn. is necessary a Young's rod and disk still-head and double surface condenser are used. The receiver should be in a freezing mixt. and a  $CaCl_2$  guard tube is quite necessary. Results of expts. are tabulated.

ERLE M. BILLINGS.

Folin's direct nesslerization method for the determination of nitrogen (LANGSTROTH) 11B.

SMITH, GEORGE MCPHAIL: *Quantitative Analysis*. New York: The Macmillan Co.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

Two new zircon minerals, *orvillite* and *oliveiraite*. T. H. LEE. *Revista Sociedade Brasileira Ciencias* 1917, 31-8. Translation. J. C. BRANNER. *Am. J. Sci.* 47, 126-32 (1919).—Specimens of zirconiferous rock from Caldas, State of Minas Geraes, Brazil, gave on analysis:  $\text{Al}_2\text{O}_3$  0.15,  $\text{ZrO}_2$  71.88,  $\text{TiO}_2$  0.62,  $\text{FeO}$  0.43,  $\text{SiO}_2$  25.31,  $\text{H}_2\text{O}$  1.56, sum 99.95%. By treatment with a mixt. of HCl and HF the mineral was decompd. and a residue of  $\text{ZrO}_2\cdot\text{SiO}_2$  obtained, which was 41% of the original rock and contained one-half of the  $\text{SiO}_2$ . On sepg. homogeneous material from a new specimen by means of a needle and microscope, the sepd. part gave:  $\text{ZrO}_2$  68.04,  $\text{SiO}_2$  25.45,  $\text{H}_2\text{O}$  and vol. matter 6.35, corresponding to  $8\text{ZrO}_2\cdot 6\text{SiO}_2\cdot 5\text{H}_2\text{O}$ . As the identification of this mineral was due to the work of Orville A. Derby, the name *orvillite* is proposed. Samples of a mineral from Pomba, Minas Geraes, Brazil, gave on analysis:  $\text{Ta}_2\text{O}_5$  1.46,  $\text{Cb}_2\text{O}_5$  and  $\text{ZrO}_2$  36.39,  $\text{TiO}_2$  25.00,  $\text{CeO}_2$  0.46,  $\text{Yt}_2\text{O}_3$  (group) 23.08,  $\text{UO}_2$  10.06,  $\text{PbO}$  0.14,  $\text{H}_2\text{O}$  2.41, sum 99.00%. A quantity of homogeneous material sepd. under the microscope gave:  $\text{ZrO}_2$  63.36,  $\text{TiO}_2$  29.92,  $\text{H}_2\text{O}$  6.48, sum 99.76%, corresponding to  $3\text{ZrO}_2\cdot 2\text{TiO}_2\cdot 2\text{H}_2\text{O}$ . The name *oliveiraite* is proposed for this mineral, in honor of the veteran Brazilian geologist, Francisco de Paula Oliveira. L. W. RIGGS.

The supposed case of tin in statu nascenti in the Malay Peninsula. W. R. JONES. *Geol. Mag.* 1, 537-41 (1914).—Analyses of geyserite and the waters of the hot springs from Ayer Panas and Cheras failed to show traces of Sn. It is suggested that Meunier's cavernous opal "similar to geyserite, but containing Sn as a peculiar and characteristic constituent" (*Compt. rend.* 110, 1085) was a specimen of weathered cassiterite-bearing quartz obtained a short distance from the hot springs at Cheras.

S. G. GORDON.

A graphic intergrowth of diopside and ilmenite from the Bembesi Diamond Field, Southern Rhodesia. A. M. MACGREGOR. *Trans. Geol. Soc. S. Africa* 18, 1-4 (1916).—Estn. of the % of ilmenite, by the sp. gr. of the mixture, gave values ranging from 21.85 to 29.3%, and calcns. from the areas shown in thin section gave 26.35 to 32.06%. The possible explanations of the mixture are that it is a segregation from the kimberlite, or a cognate xenolith brought up in a solid state from the fundamental basin. If the first explanation is adopted, the intergrowth is a warning that a graphic structure is not necessarily an indication of the last stages of solidification or of eutectic compn.

S. G. GORDON.

Occurrence of radioactive minerals in South Africa. A. W. ROGERS. *Trans. Geol. Soc. S. Africa* 18, 5-10 (1916).—Monazite, euxenite and fergusonite occur in gravels, with cassiterite, corundum, scheelite, magnetite and garnet, in Embabaa Swaziland, supposedly derived from the gneissic rocks of the region. Euxenite occurs in pegmatites at Kenhardt. Tantalite and columbite occur in lumps and crystals (one group weighed 16 lbs.) in pegmatite with feldspars, quartz, muscovite, lepidolite, garnet, beryl, and spodumene in Little Namaqualand. Analyses of euxenite, columbite and tantalite are given.

S. G. GORDON.

Description of a carbonaceous mineral occurring in the Witkop mine, near Zeerust, Transvaal. C. ANDERSON. *Trans. Geol. Soc. S. Africa* 18, 129-31 (1916).—The mineral occurs as spherical or irregularly rounded pellets up to  $\frac{3}{4}$  inch, imbedded in calcite, and in one case, in vein quartz. The carbon occurs in two forms: anthraxolite, black, lustrous, highly polished, brittle, sp. gr. 1.845,  $H = 3-4$ ; and schungite, duller in appearance, soft enough to mark paper, sp. gr. 1.122. Analyses by J. C. H. Mingaye gave: anthraxolite, C 92.74, H 0.81, N and O 1.57, S 0.45,  $\text{H}_2\text{O}$

2.90, ash 1.53 = 100%; schungite, C 98.29, H 0.72, N, O, and S 0.29, ash 0.70 = 100%.  
S. G. GORDON.

**The future of British mineral resources.** H. LOUIS. *Nature* 102, 366-7(1919).—An abstr. of a report by Lionel Phillips, Controller of the Dept. for the Development of Mineral Resources in the United Kingdom. It is shown that the production in Great Britain of the minerals Pb, Sn, Zn and Cu is far short of the consumption, and it is suggested that there be formed a Mines Dept. which will have for its object the study and encouragement of the home mineral industry. W. H. ROSS.

**Genesis of the ores at Tonopah, Nevada.** EDSON S. BASTIN AND FRANCIS B. LANEY. U. S. Geol. Survey, *Professional Paper* 104, 47 pp.(1918).—The following are some of the more important conclusions: The hypogene or primary ores have been modified in places by oxidation and enrichment through the agency of the air and oxygenated solns. originating at or near the surface. The high Ag content of much of the ore obtained in the past and of some ore now remaining is due in part to these processes. There is evidence of recent oxidation of the ores, also of at least one period of ancient oxidation. Supergene sulfide enrichment was probably an accompaniment of each of these periods. The rich ores now mined in this region are believed to be of primary origin. Mining has shown that in certain veins the primary sulfides become less abundant with increasing depth, though the same species are present; mere increase in depth may account for this change in some veins, for every vein must end in depth as well as laterally; in many veins change in wall rock has been a contributing factor. The veins developed by other deep workings are heavily mineralized and of high grade, and the geologic evidence is favorable to the persistence of rich primary Ag ores to depths considerably greater than those yet attained in mining operations. Although hot ascending waters are encountered in a number of the deeper workings, there is little evidence that these waters are now depositing ores. L. W. RIGGS.

**The factors influencing gold deposition in the Bendigo Goldfield.** II. F. L. STILLWELL. Commonwealth of Australia, Adv. Council of Sci. and Ind., *Bull.* 8, 47 pp.(1918); cf. *C. A.* 13, 299.—An inspection of the auriferous reefs at Maldon on the southern side of the Harcourt granodiorite massif has provided further evidence of the nature of the relation of the reefs to the granodiorite. Numerous reefs at Maldon can be traced along their strike to the edge of the granodiorite where they peter out, the reefs occurring around the whole periphery of the granodiorite mass. Five analyses of the carbonate in the Bendigo reef indicate that the carbonate is not always ankerite, but sometimes calcite and pistomesite. Beds of sandstone sometimes pass into masses of quartz, the matrix having been replaced by the mineral solns., and the quartz grains of the sandstone further enlarged. Evidence is presented that the faults are older than the reefs. Movement has occurred along some of the fault planes after deposition of the quartz, with the production of quartz "pug" and slickensided quartz. Spurry systems occur, many of the spurs having developed by the infiltration of the mineral solns. from backs, faults, and porous beds into other fractures. The growth of a spur proceeds from a fracture by pushing the wall apart; at the same time a replacement of the country rock frequently occurs. Spurs sometimes appear to have developed in porous beds like sandstone by crystn. of the material enclosed in the pores. Saddle reefs usually show some evidence of replacement, and are the combined result of growth from fractures and replacement, having developed where arched fractures, formed over the anticline during the period of folding, are crossed by radial fractures. Faulting modifies the forms of the saddle reefs. Further examples have been observed in which enrichments have occurred in leg reefs in the neighborhood of the intersection with faults or cross-spurs. The size of the gold shoot seems to depend in part on the volume of the mineral solns. that issued from the particular fracture. If a Au-bearing spur is

partly formed by replacement, the Au may be localized in the neighborhood of the slaty laminas, which may be considered to have pptd. the Au. If lined with ankerite, the Au appears along the walls of the spur between the ankerite and the quartz, this relation indicating that ankerite has been a precipitant of the Au. In view of the persistence of the saddle reefs along their strike, it is probable that the flow of the mineral solns. in the longitudinal direction has been important, Au shoots occurring where the solns. are brought into contact with a precipitant.

S. G. GORDON.

**Geology and ore deposits of the Yerington District, Nevada.** ADOLPH KNOFF. U. S. Geol. Survey, *Professional Paper* 114, 66 pp.(1918).—The general geology and petrography of the district is given. The main ore bodies are Cu-bearing deposits characterized by a gang of either pyroxene, garnet, or epidote, or a mixt. of these minerals. Chalcopyrite is the chief Cu-bearing mineral; pyrite is commonly associated with it but no other primary sulfides occur in the district. The primary and secondary minerals of the ore deposits are described and many analyses quoted.

L. W. RIGGS.

**The oxidized zinc ores of Leadville, Colorado.** G. F. LOUGHLIN. U. S. Geol. Survey, *Bull.* 681, 87 pp.(1918).—Although the existence of Zn in this locality has been known for 30 years, it was not until 1910 that the importance of this occurrence was realized. A brief description of the mines and output is given. By far the most abundant ore is smithsonite, which is fully described and illustrated. Hydrozincite,  $\text{ZnCO}_3 \cdot \text{Zn(OH)}_2$ , aurichalcite,  $2(\text{Zn,Cu})\text{CO}_3 \cdot 3(\text{Zn,Cu})\text{(OH)}_2$ , calamine,  $\text{H}_2\text{Zn}_2\text{SiO}_5$ , hetaerolite ("wolfontite"),  $2\text{ZnO} \cdot 2\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$ , and chalcophanite,  $(\text{MnZn})\text{O} \cdot 2\text{MnO}_3 \cdot 2\text{H}_2\text{O}$ , occur in varying amts. Five analyses of zinciferous clays are quoted, four of which show 31.49 to 35.40% of ZnO. More than a dozen of associated minerals are described. Fifteen pages are devoted to a chem. discussion of the genesis of the ores.

L. W. RIGGS.

**Genesis of the zinc ores of the Edwards District, St. Lawrence County, N. Y.** C. H. SMYTH, JR. N. Y. State Mus., *Bull.* 201, 40 pp.(1918).—The ore deposits occur in a belt of Pre-Cambrian, Grenville, metamorphosed limestone, with minor amounts of schist, quartzite, etc. On the north the limestone is overlain by schist, cut by pegmatite, granite and injected granitic material. To the south of the limestone there is an extensive area of younger granite, intrusive in the sediments. The ores form veins or irregular masses, sometimes sharply defined with well marked walls, again as irregular mineralized portions of the limestone, but cutting across its stratification. The ore is a compact, granular aggregate of sulfides, pyrite, sphalerite, and sometimes a little galena, with varying amts. of calcite, diopside, tremolite, phlogopite, serpentine, talc, barite, and occasional films of secondary greenockite. A peculiar mineral occurs in small amt., with a vermicular habit, identical with leverrierite except in its pleochroism. The limestone is a cryst. aggregate of calcite, with varying amts. of diopside, tremolite, phlogopite, serpentine, talc, and doubtful weathering products. Diopside has altered to serpentine, the latter having replaced calcite to a certain extent; tremolite has altered to talc. As talc is less hydrated than serpentine, it formed at a higher temp. on the descending temp. scale of metamorphism, and is distinctly older. Some serpentine has developed at the expense of the talc. The sulfides have replaced calcite and the silicates. The major part of the sphalerite was formed before the serpentine, but a generation of lighter colored sphalerite formed during the period of hydrothermal alteration. The silicates of the limestone are due to contact metamorphism, which, due to the thorough injection by granitic material, is regional, rather than local, in effect. The ore deposits are classed as of high-temp. type, with the sequence (1) diopside, tremolite, developed by contact metamorphism; (2) pyrite; (3) sphalerite; (4) galena, (5) talc, (6) serpentine; controlled by decreasing temperature. Throughout the process

calcite was subjected to repeated soln. and recrystn. The granite magma is considered the source of the ores, and of the solns. effecting the alteration of diopside and tremolite to serpentine and talc.

S. G. GORDON.

Geology and mineral deposits of the Colville Indian Reservation, Washington. J. T. PARDEE. U. S. Geol. Survey, *Bull.* 677, 180 pp.(1918).—The geography, geology and metalliferous deposits, including mines and prospects, are described. Omak Lake in this region has an area upwards of 3500 acres, the water containing 5566 parts per million of total solids which may be combined as  $K_2SO_4$  9.93,  $Na_2SO_4$  22.62,  $Na_2CO_3$  57.20, other salts 10.25%. A bay covering 400 acres is connected with the lake by a strait 400 ft. wide and might perhaps be used as an evap. basin. L. W. RIGGS.

Potash in saline waters in Saskatchewan. D. B. DOWLING. Canada Geol. Survey, Dept. Mines, *Summary report* 1917, Part C, pp. 36-46(1918).—Analyses of waters from northeastern Saskatchewan, the shales of Pembina Mountain, the gumbo derived from the washing of shales into the Red River Valley, and the boulder clay of the Regina district, show appreciable K. Water at Quill Lake at Wynward showed: KCl, 16.33 parts per 100,000. An analysis of water from Talmage gave: Na and K sulfates 117.992 and Na and K chlorides 0.970 part per gallon. Boring for K is in progress near Weyburn.

S. G. GORDON.

The deposits of potassium salts of Dallol, Eritrea. M. GIUA. *Gass. chim. ital.* 48, II, 1-8(1918).—The KCl deposits of Dallol, northern Danalia, Eritrea, have been mentioned at various times. Many samples of Na and K minerals were analyzed. The  $H_2O$ -insol. portion was composed of about 90% hydrated Fe oxide with traces of S,  $Al_2O_3$ , and  $SiO_2$ . The analyses of 15 KCl specimens showed 23.00 to 98.60% KCl (8 were over 90%). Most of the remaining  $H_2O$ -sol. material was NaCl, although  $MgCl_2$ ,  $MgSO_4$ , and  $CaSO_4$  were present in small amts. and sometimes as much as 2.00%. The insol. residue varied from 0.03 to 11.00% and in 4 cases exceeded 7.00%. Analyses of 17 NaCl minerals showed 16 above 57.45% NaCl, 1 with 6.00 and 7 over 94.20% NaCl. In only 6 specimens was KCl found and then did not exceed 2.00%.  $MgCl_2$ ,  $MgSO_4$ ,  $Na_2SO_4$ , and  $CaSO_4$  were mostly present in small amts., but never over 2.53%. The  $H_2O$ -insol. residue varied from 0.02 to 46.65% in 16 cases and was 80.97% of the sample containing 6% NaCl. The important known K salt deposits besides that of Stassfurt are those of Wittelshain, Santander (Spain) and Tarapan, (Chili). In their importance the deposits of Dallol are only to be compared with those of Stassfurt. The Stassfurt deposits containing KCl are difficult of access while those of Dallol lie largely on the surface. The purity of the minerals is such as to indicate that the deposits are not formed stratigraphically. Only a trace of Br is present. Thermal springs of  $MgCl_2$  (80-90°) occur in this same region so rich in  $MgCl_2$  that they solidify on cooling. Satd.  $MgCl_2$  springs (about 40°) also occur here. Further data on these subjects will be reported later.

E. J. WITZEMANN.

The Adirondack graphite deposits. HAROLD L. ALLING. N. Y. State Mus., *Bull.* 199, 150 pp.(1918).—Graphite deposits occur in Essex, Warren, Washington, and Saratoga counties, in a district of Pre-Cambrian, Grenville, cryst. limestone, quartzite, para-schist and gneiss, into which have been intruded granite (now gneissic), metagabbro, anorthosite, syenite and diabase of Laurentian and Algoman age. The various deposits and prospects are described in detail, with maps and quant. microscopic analyses of the ore. The graphite in the northern area occurs as contact deposits, most commonly between pegmatite and limestone, but also between pegmatite and biotite-hornblende schist, amphibolite and quartzite, and in other cases between syenite and gabbro with limestone and other sedimentary rocks. Graphite is not, however, always developed at the contact of an igneous and sedimentary rock. The contact de-

posits usually appear striking and exceedingly rich, but they prove to be too uncertain, too pockety, and too limited in extent to pay for mining, while the milling of graphite is still in the exptl. stage. The commercial deposits are the bedded deposits of the graphitic schists of the southern area which include normal quartz schist, feldspar-quartz-schist, a metaarkose, and a phase of the Dixon schist mildly contact-metamorphosed with the development of pyroxene and tourmaline and the redistribution of the graphite, resulting in an abnormally high content in certain layers. The concn., milling problems, and comm. status are discussed. After reviewing the various theories of the origin of the graphite, A. concludes that the deposits in the schists and metaarkose are of organic origin, and those of the contacts and veins inorganic.

S. G. GORDON.

**Graphite in Port Elmsley District, Lanark County, Ontario.** M. E. WILSON. Canada Geol. Survey, Dept. Mines, *Summary Rept.* 1917, E, 298-42e(1918).—The graphite deposits occur in a region of Pre-Cambrian limestones, pyroxene-gabbro, pyroxene syenite, hornblende-biotite granite and syenite, metamorphic pyroxenite, Paleozoic sediments, and unconsolidated quaternary deposits. The graphite deposits occur in the Pre-Cambrian basal complex, mainly in a highly silicated Grenville limestone, with which are associated a small amt. of quartzite and considerable masses of monzonite and orthoclase-pegmatite. The richest ore-bodies occur at the crests of folds, or at other points where the structure relationships indicate that a relief of pressure has occurred. Low-grade ore containing 4-6% graphite consists mainly of calcite with disseminated silicates; high-grade ore containing 15-20% graphite consists mainly of silicates—diopside, orthoclase, titanite, calcite, graphite and pyrite. The relationships can be accounted for on the assumption that the graphite is due to emanations from igneous intrusives, or was derived from the  $\text{CO}_2$  of the limestone by reduction. The association of graphite with zones of silication in the limestone, and increase in amount with intensity of silication, would seem to indicate that the graphite was in some way associated with the pegmatite intrusions, which effected the silication of the limestone. Gaseous or aqueous emanations would tend to accumulate at the crests of folds. There would likewise probably be a greater accumulation of graphite at such points whether it emanated from the igneous intrusives or was derived from  $\text{CO}_2$  set free by silication of the limestone.

S. G. GORDON.

**Geological reconnaissance for phosphate and coal in southeastern Idaho and western Wyoming.** ALFRED R. SCHULTZ. U. S. Geol. Survey, *Bull.* 680, 81 pp. (1918).—Phosphate deposits are generally distributed throughout this region. Analyses of 10 samples showed several containing the equiv. of 70%  $\text{Ca}_3(\text{PO}_4)_2$ . The rock now shipped from this region is sent to the Pacific coast. The chief obstacle to the development of these deposits is the cost of transportation. Beds of coal have been found in several localities in this field, and are at present being mined in a few places. The coal is of the bituminous variety. Rejecting one sample out of 7, the remaining 6 as obtained from the mine gave: H, varying from 4.81 to 5.94; C, 66.18 to 70.34; N, 1.29 to 1.52; and B. t. u., 11440 to 12880.

L. W. RIGGS.

**The geology of the Swaziland Coalfield.** J. JERVIS GARRAD. *Trans. Geol. Soc. S. Africa* 17, 75-84(1915).—The physical and geological features of the district are described, and analyses of the coal given.

S. G. GORDON.

**The Arnprior-Quyon District, Ontario and Quebec.** M. E. WILSON. Canada Geol. Survey, Dept. Mines, *Summary Rept.* 1917, E, 42e-43e(1918).—Molybdenite deposits occur in the Ottawa Valley as: segregations with pyrite, pyrrhotite, fluorite, quartz and orthoclase in quartz syenite; veins with pyrite; pyrrhotite and quartz in granite gneiss; in pegmatite dikes and feldspathic quartz veins; in contact metamorphic



deposits. Veins of galena, calcite, fluorite and barite are of common occurrence in the Ottawa Valley intersecting the Paleozoic and older rocks. S. G. GORDON.

Peace River Section, Alberta. F. H. McLEARN. Dept. of Mines, Canada Geol. Survey, *Summary Rept.* 1917, C, 14c-21c(1918).—The stratigraphy, structure, and economic geology of the region are described and analyses of coal, lignite and oil given. S. G. GORDON.

The Ohio shales of Southwestern Ontario. M. Y. WILLIAMS. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917, E, 26c-28e(1918).—The shales are dark gray, black or brown, occurring just above the Hamilton formation. Proximate analyses and results of distn. tests are given. S. G. GORDON.

Surface deposits of Southeastern Saskatchewan. J. STANSFIELD. Canada Dept. Mines, Geol. Survey, *Summary Rept.* 1917, C, 41c-52c(1918).—The deposits and economic geology of the region are described and 12 analyses of water given. S. G. GORDON.

The Crawfordjohn essexite and associated rocks. ALEXANDER SCOTT. *Geol. Mag.* 2, 455-61, 513-9(1915).—The intrusion occurs on the west side of Craighead Hill, 2½ miles east of Crawfordjohn, in Ordovician grits and shales, folded and lying nearly vertical, and considerably metamorphosed by the intrusion. The essexite is a gray compact rock with numerous phenocrysts of augite, being, however, at the margin aphanitic (monchiquite). Microscopically the rock consists of olivine crystals, laths of feldspar, large augite phenocrysts, with ilmenite, apatite and a little biotite; the interstices are filled with nephelite and analcite. The contact effects are described in detail, and analyses of the rock are given. S. G. GORDON.

Tektites from British Borneo. F. P. MUELLER. *Geol. Mag.* 2, 206-11(1915).—Tektites were found in 1913 near Tutong Station, southwest of Brunei, apparently washed out of a white quartz sand deposit. The stones are dark greenish brown, with brilliant luster, triangular, egg-shaped, or spherical, weighing 0.5-11.72 g., and scored with fine marks. Microscopic examn. showed them to be pure glass; sp. gr. 2.457,  $H_6$ ,  $n_D = 1.5097$ . Analysis by Dr. Hinden gave:  $SiO_2$  70.90,  $Al_2O_3$  13.50,  $Fe_2O_3$  0.32,  $FeO$  5.47,  $CaO$  2.35,  $MgO$  2.45,  $Na_2O$  1.46,  $K_2O$  2.17,  $TiO_2$  (estd.) 1.00,  $MnO$  tr., sum 99.62%. S. G. GORDON.

The petrology of the Suffolk box-stones (Crag). P. G. H. BOSWELL. *Geol. Mag.* 2, 250-9(1915).—The box-stones are masses of hard, brown sandstone about the size of the fist, often well rounded, and frequently containing fossils, including wood, bone, teeth, and casts of mollusca. Microscopically the rock is a coarse sandstone made up of clear quartz grains in a brown matrix. Analysis showed 20.1% Ca phosphate. The following minerals were noted in the box-stones: magnetite, garnet, zircon, rutile, ilmenite, tourmaline, calcite, apatite, quartz, andalusite, staurolite, topaz, marcasite, actinolite, hornblende, epidote, muscovite, titanite, orthoclase, microcline, plagioclase, cyanite, limonite, glauconite, and opal. S. G. GORDON.

The genesis of chialstolite; and its supposed occurrence in association with a basic intrusion. ALFRED BRAMMALL. *Geol. Mag.* 2, 224-8(1915).—Chialstolite is described as occurring as embryonic microscopic aggregations in a shale altered by a basic sill intrusive at Marston Jabet, near Nuneaton. The production of the mineral depends upon maintaining a comparatively low temp. within a restricted range, and is effected by meteoric or juvenile waters. S. G. GORDON.

Possible harmonizing of the hydrous and anhydrous theories of volcanism. A. GUEBHARD. *Compt. rend.* 167, 955-8(1918).—A discussion. L. W. RIGGS.

A biochemical theory of the origin of indianaite. WILLIAM N. LOGAN. *Science* 44, 197(1919).—Indianaite (halloysite) occurs as a white porcelain-like mineral in

beds up to 11 feet thick in the Mississippian and Pennsylvanian rocks. The following biochem. theory is advanced to account for the deposits: shales containing pyrite are weathered and sulfuric acid is produced, which attacks the clay, forming Al sulfate. S bacteria absorb the sol. alum, rob it of its S, secreting Al in the form of a hydrated silicate, which by partial dehydration is rendered insol., becoming indianaite. Bacteria similar to *Beggiatoa alba* have been isolated, and their influence has been demonstrated in the lab.

S. G. GORDON.

**Elaboration of silica and calcium silicates by algae of the *Girvanella* group.** JACQUES DE LAPPARENT. *Compt. rend.* 167, 999-1001(1918).—It has previously been observed that crystals of albite may exist in the midst of granular limestone elaborated by the action of algae of the *Girvanella* group upon calcareous organisms in the rocks at the base of the upper Cretaceous of the western Pyrenees. Certain of these limestones when treated with HCl yield a large amt. of foraminifera which resist the action of the acid. Upon isolation it is seen that they have been entirely transformed to chalcedony. The elaboration of  $\text{SiO}_2$  and the transformation of calcareous into siliceous organisms, as well as the production of granular limestone is the work of *Girvanella*. In the Ca silicate the  $\text{SiO}_2$  is united to CaO in the proportion of a metasilicate and  $\text{Al}_2\text{O}_3$  adds itself to the Ca metasilicate mol. to mol. The sol. part of the limestone is 97.6%  $\text{CaCO}_3$  and 2.4 Al silicate yielding a formula  $\text{RO}_2\text{MO}$ , the  $\text{Al}_2\text{O}_3$  being computed partly as acid and partly as base.

L. W. RIGGS.

Tungsten, with special reference to the Black Hills of South Dakota (RUNNER, HARTMAN) 9.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

**Mining and milling of lead and zinc ores in the Missouri-Kansas-Oklahoma zinc district.** C. A. WRIGHT. *Bur. Mines, Bull.* 154, 126 pp.(1918).—A detailed account, with illustrations, maps, flow sheets, drawings, and tables, of investigations made by the Bureau of the methods used in mining and milling. The conditions that affect the efficiency of the methods are discussed in some detail, together with the possibilities of making certain improvements that would effect a greater saving. The publication cannot be very well abstracted.

F. W. SMITHER.

**The Middlemarch mine and mill.** B. M. SNYDER. *Mining Sci. Press* 118, 181-2 (1919).—A description, with illustrations and flow sheet, of operations at the Middlemarch mine and mill near Pearce, Ariz. An ore averaging 2% Cu as chalcopyrite is coned. by straight flotation, using a mixt. of coal tar (80%), pine oil, and coal-tar creosote. Crushing is done by ball-mill, flotation by launder pneumatic and K and K machines. The recovery is over 90%.

F. W. SMITHER.

**Cheap leaching of gold-ore tailings.** ANON. *Eng. Mining J.* 107, 226(1919).—A description of a method (Australian patent N. 6516, of 1918) of cyaniding tailings in vats the sides of which are formed by the sepd. slime.

F. W. SMITHER.

**Review of the manganese situation.** C. M. WELD. *Bur. Mines War Minerals Investigations Ser.* 1918, No. 7, 12 pp.—Specifications governing the sale of metallurgical Mn ores are discussed, including the matter of premiums and penalties on silica and P in the ores, as adopted by the Ferro Alloys Committee of the Iron and Steel Inst., and effective in May, 1918. Statistics on imports and domestic production for the period 1913-18 are shown for Mn ores and alloys, as well as on the comparative prices for the period 1910-18. The threatened shortage of Mn of a number of months

ago has entirely disappeared, due to the powerful stimulus exerted on the industry by high prices and patriotic motives. In spite of reduced importations the country's stocks are steadily increasing.

A. L. FEILD.

Gold, silver, copper, lead and zinc in Utah in 1917. Mines report. V. C. HIEKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 167-202 (preprint No. 12, published Feb. 8, 1919); cf. C. A. 12, 669.

E. H.

Aluminium bronze industry. W. M. CORSE. *Chem. Met. Eng.* 20, 162-3 (1919).—See C. A. 13, 226.

E. H.

Occurrence, chemistry, metallurgy and uses of tungsten, with special reference to the Black Hills of South Dakota. J. J. RUNNER AND M. L. HARTMAN. S. Dakota School of Mines, *Bull.* 1918, No. 12, 236 pp.; cf. Hess, C. A. 11, 3211.—W deposits in Black Hills are confined to 3 areas: (1) vicinity of Harney Peak in pegmatitic granite and quartz veins, principally as wolframite; (2) Nigger Hill district in Pre-Cambrian rocks as wolframite, small amts. of scheelite, hubnerite and ferberite; (3) Lead-Deadwood district as wolframite and some hubnerite in Cambrian dolomite and basal quartzite locally known as Deadwood Formation. The last named are replacement deposits. Some wolframite is found in rhyolite porphyry, which is regarded as source. Until 1915 all Black Hills W ore was sold as hand-picked ore. The Homestake mill at Lead, which is in operation at present, began concg. ores 1915. Gold recovery pays for ore treatment. Other mills in operation in 1916 and 1917 are not now in operation. The chemistry, metallurgy and uses of W are discussed completely and authoritatively. Special attention is given the use of W in high-speed tool steel. An exhaustive bibliography of W is included.

BYRON H. SMITH.

The reduction of tungstic oxide. C. W. DAVIS. *J. Ind. Eng. Chem.* 11, 201-4 (1919).—An exptl. study reported in detail. Summary: "(1) The  $WO_3$  used for reduction must be pure, dry, and in a state of fine division. (2) When reduced with C, the  $WO_3$  should be thoroughly mixed with it. (3) At  $650^\circ$  to  $850^\circ$   $WO_3$  goes to a blue or purple oxide when heated with C; at  $900^\circ$  to  $1050^\circ$  a chocolate material is the result; and at temps. above  $1050^\circ$  the gray powdered metallic W results. (4) As the W is easily oxidized, the reduced material must be cooled in a reducing atm. (5) The ratio of  $WO_3$  to C varies from 10:1 to 10:1.6, depending on the process used, the temp. of reduction and the time involved. (6) Excess C can be partially removed by washing. (7) Fire-clay crucibles or Fe tubes give satisfactory reduction with a product of over 98% W. Under the conditions of the test some oxides resulted at portions nearest the crucible cover and tube ends. (8) Fire-clay is not attacked by the charge at the temp. used. The Fe tubes suffer considerable oxidation on the outside. (9) A continuous process could be arranged to get a W powder free from oxides. (10) The time of reduction of small samples at  $1100^\circ$  is less than 1 hr. (11) The temp. of reduction with H at ordinary pressures is much the same as with C. The product is over 98% W."

F. W. SMITHER.

Production of ferromanganese in blast furnaces. P. H. ROYSTER. *Bur. Mines War Mineral Investigations Ser.* 1918, No. 5, 31 pp.; cf. C. A. 12, 452.—A study of 11 blast furnaces making ferromanganese. Tables and charts of data are given. Fe-Mn furnaces operate at lower temps. than Fe furnaces. Gas analyses show that practically all the MnO is reduced "directly" by C, probably in the hearth. "Volatilization" loss of Mn is not affected by any change in furnace conditions. Slag loss of Mn is decreased by raising the blast temp., increasing the basicity of slag and charging more coke; it is increased by fast driving and carrying a greater "slag volume." A general equation is given for the % of Mn in slag as a function of these 5 quantities, by means of which the slag loss can be calcd. in advance from charge-sheet data. Five changes in practice

are recommended: (a) using better grade of coke, (b) better grade of stone, (c) less fuel, (d) running with a more basic slag, (e) driving faster. Special emphasis is laid on the desirability of low-SiO<sub>2</sub> stone. An estd. increase of \$20,000,000 in annual net profits of the 11 furnaces examd. would be brought about if the above changes were made. There is greater opportunity for improvement in selection of coke and stone than in furnace practice.

BYRON H. SMITH.

The application of pyrometers to core ovens. G. W. KELLER. *Foundry* 47, 72-4(1919).—The author points out how the demands of modern industry have developed refinements in core room and foundry practice.

F. W. SMITHER.

Carbon Steel Co. additions. ANON. *Iron Age* 103, 349(1919).—A brief description of a new forge building and of a 72-in. jobbing plate and sheet mill (in course of installation). Other improvements are touched upon.

F. W. SMITHER.

The Utah copper enterprise. IX. The smelting of the concentrate. T. A. RICKARD. *Mining Sci. Press* 117, 853-60(1918); cf. C. A. 13, 303.—The H<sub>2</sub>O content of 13.6% carried by the mixt. of table and flotation concentrates causes the smelter a great deal of trouble in sampling, handling, and roasting. Its treatment at the Garfield smelter is described. Nodulizing of the concentrates in rotary kilns is suggested. This is practiced at Braden, Chile, and has been experimented with at Chrome, N. J., and Princeton, B. C. A 100-ft. kiln would nodulize 100-125 tons in 24 hrs., at the same time accomplishing partial desulfurization. With oil as fuel the consumption was 6-7 gal. per ton of concentrate.

A. BUTTS.

The manufacture of copper driving bands. W. J. REARDON. *Metal Ind.* 17, 63-8(1919).—The manuf. of copper driving bands by the Ward process is discussed. A brief description of the Moseberg method is given.

E. S. WHITTIER.

Rust-proofing of iron and steel. ELMER S. WHITTIER. *Metal Ind.* 17, 79-82(1919).—The Parker rust-proofing process is described. The preliminary treatment of the metallic surfaces before processing is discussed.

E. S. WHITTIER.

Electric welding. THOMAS T. HEATON. *Electrician* 82, 154-6(1919); 4 illus.—A review.

C. G. F.

Welding process with special reference to machinery repairs. G. F. CHARNOCK. *J. Soc. Dyers Colourists* 35, 5-2(1919); illus.—A description and scientific discussion of the principles involved in various types of welding, including smith welding, fusion welding, O-H process, oxy-coal-gas process, O-C<sub>2</sub>H<sub>2</sub>, and elec. welding, with cast Fe, Cu and Al.

L. A. OLNEY.

Tentative specifications for steel tie plates. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 445-8(1918).

E. E. R.

Tentative specifications for boiler and firebox steel for stationary service. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 449-53(1918).

E. E. R.

Tentative specifications for carbon tool steel. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 454-5(1918).

E. E. R.

Tentative specifications for low-carbon-steel track bolts. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 456-9(1918).

E. E. R.

Tentative specifications for electric cast steel anchor chain. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 460-3(1918).

E. E. R.

Tentative specifications for malleable castings. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 464-6(1918).

E. E. R.

Tentative specifications for non-ferrous alloys for railway equipment in ingots, castings and finished car and tender bearings. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 467-71(1918).

E. E. R.

**Tentative specifications for cartridge brass.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 472-5(1918).—This section contains the results of a comparative study of Brinell hardness and grain size and a discussion of immaterial and injurious effects. E. E. R.

**Tentative specifications for cartridge brass disks.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 476-7(1918). E. E. R.

**Tentative specifications for naval brass rods for structural purposes.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 478-81(1918). E. E. R.

**Tentative specifications for bronze bearing metals for turntables and movable railroad bridges.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 482-6(1918). E. E. R.

**Tentative specifications for white metal bearing alloys (known commercially as Babbitt metal).** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 487-91(1918).—In an appendix a table is given which shows the physical properties of white metal bearing metals of various chem. compn. to constitute a guide to the purchaser in selecting the grade best suited for the service conditions under which the metal is to be used. At present, owing to the shortage of Sn, the use of Pb-base metals is recommended whenever feasible. E. E. R.

**Tentative specifications for aluminium ingots for remelting and for rolling.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 487-91(1918). E. E. R.

**Tentative specifications for aluminium sheet.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 494-6(1918). E. E. R.

**Tentative specifications for light aluminium casting alloys.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 497-501(1918). E. E. R.

**Tentative definitions and rules governing the preparation of micrographs of metals and alloys.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 716-21(1918).—In addition to specifying standard magnifications and suggesting suitable lenses, the method of measuring the grain size is described. E. E. R.

**Physical qualities of high-chrome steel.** L. R. SEIDELL AND G. J. HORVITZ. *Iron Age* 103, 291-4(1919).—Expts. show that an intimate relation exists between the amt. of double carbide in solid soln., the max. hardness and the magnitude of "red hardness." With few exceptions, the micro-constituents of this kind of steel are analogous to those of common steel. When quenched from 1380° all the carbide remains in solid soln., giving a uniform structure and max. hardness. Under these conditions the tensile strength and ductility are at a max. after suitable drawing operations. The effect of initial temp. on the position of the  $A_{r1}$  point is an indication of the amt. of carbides retained in solid soln. E. E. R.

**The structure and strength of overheated rivet steel.** S. H. GRAF. *Eng. News-Record* 82, 280-2(1919).—Rivet steel may contain from 0.05 to 0.25% C according to the strength required; the av. content is 0.12% C. To study the effects of over-heating, steels with 0.11% and with 0.23% C were used. The specimens were (a) held at 1200° for 10 min. and air-cooled, (b) over-heated in the forge until sparks began to come off and kept at this temp. for 2 min., (c) refined by heating above the upper limit of the critical range for 15 min. and air-cooling from 1115°. (d) Fresh pieces were subjected to treatment (b), reduced to half the original length and forged to about 0.25 in. sq. Photomicrographs were taken of the samples after each of the above treatments. Alternating impact tests showed that the over-heated specimens were very brittle and unreliable. Over-heating raises the yield point and reduces the ductility and "reduction of area." Heat treatment improves the material. E. E. R.

**Durability of high-speed steels.** R. A. POLIAKOFF. *Iron Age* 103, 295-6(1919).—The expts. described were made at Moscow for one of the largest Russian railroads. 9 brands of commercial high-speed steels were tested. The C content was very low for all the steels. According to Taylor, the best high-speed steels have between 0.50 and 0.68% C in order that the steel may be easily forgeable, not too brittle but sufficiently hard. In these steels, the C limit was still lower. All of the brands were low in Mn and did not contain over 0.15% Si, which indicates that Taylor's suggestions have been adopted. The S and P contents were low in all cases. The W content varied from 10.4 to 18.2%, none of the newer steels contained V, only one contained Mo, and 2 contained Ni. The steels were all sold at the same price but the durability varied from 21.5 min. to 2 hr. W. T. H.

**Effect of heat treatment on bronze.** F. F. HAUSEN AND O. A. KNIGHT. *Foundry* 47, 61-5(1919).—The effects of heat treatment on bronze containing 59% Cu, 39% Zn, 1.5% Fe and 0.5% Mn are shown by photomicrographs and by hardness values. The Brinell test verified the conclusion to be drawn from the microstructure, i. e., that the specimen quenched at 800° and drawn at 300° would be the hardest. Above 300°, the hardness gradually decreased with rise in drawing temp. W. T. H.

**Reducing the malleable iron annealing period.** A. E. WHITE AND R. S. ARCHER. *Foundry* 47, 61-5(1919).—In producing malleable Fe, practical men usually insist on a slow heating, a low annealing temp., and a very slow cooling. If, however, the annealing temp. is raised a little above the critical point and then kept at about 700° long enough to convert about 0.7% of combined C to graphitic C, considerable time can be saved and malleable Fe of good quality produced. Hard spots, such as are likely to result by segregation of Mn or S are avoided by this treatment. Cooling at the rate of 8.3° per hr. from the critical temp. down to 660° is a safe rate and at this temp. the furnace may be opened. The initial heating must not be too rapid. W. T. H.

**Comparison of the internal elastic equilibrium of alloys after quenching and after cold drawing.** A. PORTEVIN. *Compt. rend.* 167, 1033-5(1918).—The internal stresses produced by hardening have been compared with those produced by cold work. This paper is meant to serve as a warning against carrying this comparison too far. Brass with about 60% Cu was tested after quenching at 760° and after cold drawing. Plotting the internal stresses against the surface area of the specimens gave curves which were inversely proportional to one another. W. T. H.

**The alterability of aluminium.** Corrosion and disintegration JEAN ESCARD. *Rev. sci.* 56, 331-6(1918).—The action of acids, alkalies, and oxygen, the effect of cold work, and the action of saline solutions at different temps. are discussed in detail for commercial Al and in brief for important Al alloys. No new data are given. W. T. H.

**Ferrous alloys.** JEAN ESCARD. *Rev. gén. sci.* 29, 706-13(1918); cf. C. A. 13, 308.—The methods of manuf., uses, chem. compn. and important physical properties of Fe-V, Fe-Mo, Fe-Ti, Fe-W, Fe-Al, and Fe-Ni alloys are described. Fe-Ce, Fe-P, Fe-B, Fe-Ta, We-U, Fe-Si-Al, Fe-Si-Ni, Fe-Si-Mn, Fe-Si-Cr, Fe-Si-W, and Fe-Si-Ca-Al alloys are mentioned. W. T. H.

**The use of magnetic properties in inspecting iron and steel.** V. PREVER AND M. PREVER. *Ind. chim. min. met.* 5, 153-5, 179-82, 185-7(1918).—The decrease in magnetic permeability of steel with increase in hardness has been successfully used by Colonnetti and Pozzo in the inspection of projectiles. The apparatus used consists of a double coil, one coil being connected to a ballistic galvanometer and a continuous cur-

rent which may be reversed is passed through the other. The specimen is inserted in the center of the double coil. On reversing the current a deflection of the galvanometer is produced which depends on the permeability of the specimen. With specimens of uniform size and regular shapes such as billets, shells, etc., there is close agreement between Brinell hardness tests and the galvanometer readings. Attempts to apply this method of testing to small auto parts of irregular shapes made of Ni-Cr steel failed, there being in general no relation between the Brinell hardness and the deflections. The Brinell tests were confirmed by tension tests. The irregularities could not be explained on the basis of variation in compn. or weight. Pieces of the same form but of different alloy steels or heat treatment could be distinguished from each other, but not Ni-Cr steels of different C content.

J. S. LAIRD.

The crystal structure of gray tin. A. J. BIJL AND N. H. KOLKMEIJER. Utrecht. *Chem. Weekblad* 15, 1264(1918); cf. *C. A.* 12, 2533.—Gray Sn is cryst.; the crystals belong to the regular system, and the atoms are arranged in the same manner as the C atoms in diamond. The length of the lines of the elementary cube is  $6.46 \times 10^{-8}$  cm.; the interval between the atoms is  $2.80 \times 10^{-8}$  cm. The quadrivalency of this form is plainly evident, while in the tetragonal form 2 atoms are at a less interval from the central atom than the other 2, showing bivalency. According to later and more accurate measurements, the values  $5.85 \times 10^{-8}$  and 0.408, as mentioned in the previous paper (*l. c.*) should be  $5.84 \times 10^{-8}$  and 0.406, resp.

JULIAN F. SMITH.

Aluminum bronze alloy. ANON. *Metal Record & Electroplater* 4, 267-70(1918).—A brief illus. account of the golden Al-Cu alloy (about 91% Cu). It is used in ornamental architectural work, for cutlery, etc. The hard grade has a tensile strength of 75,000 lbs. per sq. in., after working the metal, 111,000; elastic limit 45,000 lbs. per sq. in., elongation, 1600%. The alloy can be forged, tempered, can be used for knife blades and takes a high polish. Compared to Cu it is very acid-resistant.

C. G. F.

The action of organic acids on metals. C. L. DE FOUW. Amsterdam. *Pharm. Weekblad* 55, 1497-9(1918).—To study the possible effects of organic acids upon the containers of canned goods, 0.1 and 0.01 *N* solns. of oxalic, tartaric, citric, malic, acetic and lactic acids were used. They all attack Sn rapidly in air, but scarcely at all *in vacuo* or in CO<sub>2</sub>. The effect is dependent on the concn. of acid. Neutral salts have little effect on the action, except that nitrates catalyze it markedly. All the acids oxidize more Sn than corresponds to the amt. of acid present; this is probably due to hydrolysis. In the main, insol. Sn(OH)<sub>2</sub> is formed. It is sol., however, in tartaric and oxalic acids. Some metastannic acid is formed also. The reactions with Zn are very similar; but oxalic acid has scarcely any action on Zn, and even inhibits the action of other acids. The amt. of corrosion is also dependent on the metal concn. Complex ions are formed; the Sn<sup>++++</sup> ions form complexes more readily than the Sn<sup>++</sup> ion. The series for the acids, in descending order, is: oxalic, citric, tartaric, lactic. No definite relation could be established between complex formation and rapidity of action.

JULIAN F. SMITH.

Potash content of blast furnace charges (GELLERT) 18. Refractories used in steel production (REYNOLDS) 19.

CARNEGIE, DAVID AND GLADWYN, S. C.: *Liquid Steel; Its Manufacture and Cost*. 2nd Ed. New York: Longmans, Green & Co. 526 pp. \$10.00 Cf. *C. A.* 7, 2740.

DEFFER, A.: *Fabrication des obus en fonte aciérée. Aide mémoire pour les Contremaitres*. Paris: Gauthier-Villars et Cie. 42 pp. 2 francs 75c.

GIOLITTI, F.: *Il trattamento termico preliminare degli acciai dolci e semiduri per costruzioni meccaniche*. Milano, Italy: U. Hoepli. 620 pp. L. 28. For review see *Ind. chim. min.* 6, 23(1919).

HATFIELD, WILLIAM HERBERT: *Cast-Iron in the Light of Recent Research*. 2nd Ed. Revised and enlarged. London: Charles Griffin & Co. 12s. 6d. net.

HORNER, J. H.: *Brassfounding. A Practical Treatise*. London: Emmott & Co. 190 pp. 5s.

LEBRUN, M. MAURICE: *La soudure électrique a l'arc*. Paris: Edited by the Soudure Autogène Française, 48, rue Saint-Lazare. 84 pp. For review see *Chimie & industrie* 2, 119(1919).

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**Concentrating ores.** E. EDGER and S. TUCKER and MINERALS SEPARATION, LTD. Brit. 121,303, Sep. 13, 1917. In an agitation froth process for the preferential sepn. of one metalliferous mineral from another in a mixt. containing them, *e. g.*, a mixed sulfide ore, the agents employed are a sol. soap and  $\text{Na}_2\text{SiO}_3$  in such proportions that a froth rich in one of the minerals is first obtained. After this froth has been sepd., the liquor may be dild. and re-agitated or aerated for the production of froth rich in another mineral. The ore is preferably treated in a freshly ground condition. Cf. 7,803, 1905, 2,359, 1909, 21,857, 1910 (*C. A.* 6, 1426), and 105,227.

**Ore concentration.** WM. O. ARZINGER. Can. 188,627, Feb. 11, 1919. Electrically conducting values are sepd. from associated gang by causing a fluid jet to impinge upon the surface of the contaminated liquid in the presence of air to entrain in and mix the air with the liquid while feeding the value of gang to the surface of the liquid. The jets of air produce a buoyant mass which is statically charged and which acts to bring the values quickly to the surface. Cf. *C. A.* 13, 114.

**Apparatus for ore concentration.** WM. O. ARZINGER. Can. 188,626, Feb. 11, 1919. In combination with the reservoir adapted to hold the contaminated liquid are means for causing a fluid jet to impinge on the surface of the liquid to entrain air therein and form buoyant vesicles and upwardly moving currents, means for feeding values of gang to the liquid and means for causing the currents to carry the values out of the reservoir.

**Concentrating ores by flotation.** R. GAHL. U. S. 1,290,166, Jan. 7. Ores which have generally been considered unsuitable for flotation sepn., such as sulfide or carbonate ores containing small percentages of Cu, are rendered more amenable to flotation sepn. by mixing with them Fe or steel in a finely divided form, *e. g.*, filings, before subjecting the ore to ordinary flotation treatment. Steel balls may be used for grinding the ore, thus incorporating the desired amt. of steel in finely divided form to facilitate the flotation. Addition of minute quantities of  $\text{PtCl}_4$  materially increases the amount of foam formed when air is blown through the flotation medium. Presence



of metallic Zn decreases the efficiency of the process. The Fe used may be recovered by magnetic sepn.

**Fluorinating device.** J. P. RUTH. Can. 188,640, Feb. 11, 1919. A gas diffusion device for use in flotation process comprizes a rotary head having a plurality of passages for gas extending outwardly to the periphery of the head and stationary hoods at the outer extremities of the passages.

**Treating oxide ores.** SELDEN IRWIN CLAWSON. Can. 188,548, Feb. 4, 1919. Oxide ores are fluxed in proper proportions with a halogen salt of the metalloid group, the base metal of which prefers O to Cl when in an oxidizing atm. where the desired metals are chloridized and the metalloid flux is oxidized, the metal chloride and metalloid oxides are then recovered and treated with a reducing agent to liberate the desired metal in metallic state and the metalloid oxides as chlorides.

**Treating aluminous ores.** H. A. RICHMOND. Can. 188,745, Feb. 18, 1919. Carbonaceous material and a sulfide are mixed with aluminous ore, the mixt. is heated electrically and the impurities are removed as gaseous sulfide. Elimination of the silica is thus satisfactorily obtained.

**Reducing ores.** J. M. LONGYEAR and J. T. JONES. U. S. 1,289,834, Dec. 31. Fe oxide ore or other ore to be reduced is placed in a shaft reducing furnace in which superposed sections of the charge of ore and fuel are supported at different levels and air is supplied in limited amounts through twyers at the different levels to effect deoxidizing without producing a molten bath. In the lower portion of the furnace a high-temp. metal-fixing zone is maintained near the bottom of the stack which serves to preheat, without attacking, fuel in the upper portion of the stack. U. S. 1,289,835 relates to a shaft furnace for similar operation.

**Vertical shaft furnace for reducing ores.** J. T. JONES. U. S. 1,289,800, Dec. 31. The furnace is especially adapted for the reduction of Fe ores and is provided with twyers at different levels for separately supplying air in limited amounts to ore and fuel charges supported at different portions of the shaft.

**Fume arresters for smelting plants.** ANTONIO FERRARI. Can. 188,805, Feb. 25, 1919. The smoke arrester consists of a horizontal condensing passage into which fumes pass from the furnace, a smoke stack to which one end of the passage is connected, a horizontal perforated pipe for spraying the interior of the horizontal passage and a vertical perforated pipe extending upwardly within the stack and arranged to drop a spray upon the fumes at and above the point where the fumes change their direction of movement from a horizontal to a vertical path.

**Extracting nickel from silicate ores.** H. W. C. ANNABLE. U. S. 1,289,072, Dec. 31. Garnierite ore is ground and then intimately mixed with Fe pyrites and NaCl,  $\text{Na}_2\text{CO}_3$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{K}_2\text{CO}_3$  or  $\text{K}_2\text{SO}_4$  and the mixt. is heated to  $650\text{--}800^\circ$  in contact with steam and with exclusion of air, to form NiS. The resulting product, containing FeS and NiS, is heated in air to a temp. sufficiently high to oxidize the sulfides to sulfates and to decompose the Fe sulfate without decomposing the Ni sulfate and the hot oxidized product is discharged into  $\text{H}_2\text{O}$  which is maintained at a temp. below  $30^\circ$  to dissolve the Ni sulfate. In case basic Ni sulfate has been formed, HCl is added to the  $\text{H}_2\text{O}$  to effect its soln. After sepn. of the Ni sulfate soln., the Ni may be recovered from it by pptn. with a carbonate or sulfide, *e. g.*, by addition of  $\text{CaCO}_3$  to the soln. and passing furnace gases from the roasting furnace directly into the soln. The pptd. salt of Ni is dried and heated in the atm. to form Ni oxide. If the mixt. of sulfides of Fe and Ni is heated and NaCl is then added to the product to be oxidized, a much lower yield of sol. Ni is obtained. Sea water may be used as a source of NaCl in the process.

**Ferromanganese.** J. T. JONES. U. S. 1,289,799, Dec. 31. Finely divided ore containing oxides of Fe and Mn is heated with an excess of finely divided coal, substantially out of contact with air, the product is crushed, Fe is magnetically sep'd., Mn is obtained from the residue by a gravity sepn. and selected proportions of Fe and Mn are then fused together to produce a ferro-Mn of the desired compn. Low-grade Mn ore of the Cuyuna Range in Minn. may be used in the process. A ferro-Mn low in P is produced.

**Smelting lead.** T. W. CAVERS. Can. 188,629, Feb. 11, 1919. In the blast-furnace smelting of Pb ores the charge is heated essentially by blasting in carbonaceous fuel with air into the lower part of the furnace above the normal slag level.

**Briquetting cement copper.** C. A. HALL. U. S. 1,290,024, Dec. 31. Cement Cu in association with waste liquor, such as the mixt. which is obtained by the treatment of cinders formed in roasting cupreous pyrites in the manuf. of  $H_2SO_4$ , which usually contains at least 25% of moisture, is pressed into bricks under a pressure of 250 lbs. per sq. in. and the bricks are then dried to prep. them for smelting to recover the Cu.

**Disintegrating metals to dust-like form.** E. J. HALL. U. S. 1,290,181, Jan. 7. In the production of metallic powder or dust, the metal under treatment, *e. g.*, Zn, is melted, mixed with an alloy of Al with the metal to be disintegrated, and the mixt. is then atomized in molten condition and allowed to solidify to powder. The presence of the Al renders the molten metal more fluid, thus facilitating atomization, and also serves to protect the other readily oxidizable metal (*e. g.*, Zn) from oxidation during the atomization.

**Melting metal scrap.** D. EPPELSHEIMER. U. S. 1,290,143, Jan. 7. A mixt. of scrap Fe or steel or other fragmentary metal to be melted down in an open-hearth furnace is formed into compressed blocks together with an admixture of lumps of coke. When this material is subjected to the melting operation in an open-hearth furnace, a uniform admixture and interaction of the metal and C is obtained, without undesirable segregation and floating of C masses. The compression of the mixt. is restricted so as not to destroy its porosity nor prevent access of air and gases to the coke in the mass.

**Steel.** H. C. DICKSON and J. B. NICKLIN. Brit. 121,311, Nov. 10, 1917. A steel, particularly for the production of bright drawn rods or bars for airplane or motor parts and other purposes, contains 0.1–0.3% of C, 0.08–0.25% of Si, 0.4–1% of Mn, 0.05–0.2% of V, and 0.05–0.25% of Cr. S and P are as low as possible.

**Annealing low-carbon steel.** J. H. BENNETT. U. S. 1,289,092, Dec. 31. In annealing low-C steel, the metal is heated, preferably to redness, and then cooled and softened by the application of  $H_2O$  to which 1.5% of soap has been added. The addition of the soap effects a cooling of the metal without rendering it hard or brittle.

**Castings of cerium and other rare earth metals.** A. HIRSCH and M. HIRSCH. U. S. 1,290,010, Dec. 31. In casting Ce or other rare earth metals or their alloys, the metal is introduced into a mold, which may be formed of Fe, at a temp. sufficiently close to the congealing point of the rare earth metal that danger of inflammation of metal is avoided. The mold is constructed so that its heat-absorbing capacity is not sufficient to cause material imperfections in the castings due to unequal cooling. Ce castings may be thus formed which are adapted for use as sparking devices.

**Castings of cerium or other rare earth metals.** A. HIRSCH and M. HIRSCH. U. S. 1,290,011, Dec. 31. In prepg. Ce or other rare earth metal or their alloys for casting, the metal is melted beneath a layer of molten  $BaCl_2$  to protect it from oxidation or ignition.

**White gold alloy.** DAVID BELAIS. Can. 188,628, Feb. 11, 1919. Fine Au 75 to 85%; pure Ni, 10 to 18%; and pure Zn 2 to 9%, are fused and thoroughly mixed together to produce a substitute for Pt, especially in the jewelry trade.

**Coating iron or steel to prevent rusting.** W. H. ALLEN. U. S. 1,290,476, Jan. 7. A soln. for "rust-proofing" Fe or steel is formed by dissolving 1% of ferric phosphate in a 10% soln. of  $H_2PO_4$  in  $H_2O$ .

**Solution for rust-proofing metals and for nut-locking.** C. D. MATTHEWS. U. S. 1,289,855, Dec. 31. A soln. for treating Fe or similar metals, intended for locking nuts on bolts or for forming an oxidized coating on Fe or steel, is formed of a satd. soln. of NaCl in HOAc mixed with an equal amt. of  $HNO_3$ .

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

**Stability of cyclic systems.** J. BÖSEKEN with MISS M. DE GROOT AND W. VAN LOOKEREN CAMPAGNE C. JZN. Delft. *Rec. trav. chim.* 37, 255-65(1918).—In a previous paper (*C. A.* 8, 2345) B. and Sillevs showed that cyclohexene is metastable and when passed over finely divided Ni at  $180^\circ$  in a stream of  $CO_2$  reacts thus:  $3C_6H_{10} \rightarrow 2C_6H_{12} + C_6H_6$ . The heat of combustion of cyclohexene is 892.6 Cal., that of a mixt. of  $1/3$   $C_6H_6$  and  $2/3$  cyclohexane is 884.1 Cal. There is thus a difference of 8.5 Cal. Cyclohexene (a) left in contact with Pd in a sealed tube lost the odor of (a) and no longer decolorized Br  $H_2O$ . These expts. were continued with the mixt. of cyclohexadienes (b) obtained by boiling dibromo-1,2-cyclohexane with an excess of quinoline. The reaction  $3C_6H_8 \rightarrow C_6H_{12} + 2C_6H_6$  takes place more easily than that with (a). The heat of combustion of  $C_6H_8$  is approx. 847.5 Cal., for a mixt. of  $1/3$   $C_6H_6$  +  $2/3$   $C_6H_{12}$  832.5 Cal.; or a difference of 15 Cal. (b) passed over finely divided Ni at  $180^\circ$  in  $CO_2$  loses its disagreeable odor and acquires that of  $C_6H_6$ , the d. and refraction are raised and the product is indifferent to Br. The results demonstrate the instability of dihydrobenzene. 42 g. dibromo-1,2-cyclohexane were heated under reduced pressure with 92 g. freshly distilled quinoline. The reaction begins at  $160^\circ$  and is energetic at  $180^\circ$ . The product (b),  $b_{760}$   $79.5-80^\circ$ , has an odor resembling that of isoprene. Only about 0.5 of the calcd. amt. of Br is absorbed. Further work will be required to explain this. The app. for passing (b) over finely divided Ni was that used by B. and v. Senden (*C. A.* 7, 1702). The product had lost about 99% of its capacity to combine with Br, had the odor of  $C_6H_6$  and gave  $PhNO_2$  with  $HNO_3$ . In the presence of excess H,  $C_6H_8$ , cyclohexene and cyclohexadiene easily give  $C_6H_{12}$  in the presence of Ni at  $180^\circ$  or of Pt at room temp. Under ordinary conditions the satd. ring with 6 C atoms is stable, although that of methylcyclopentane may be a little more so. Zelinskii (*C. A.* 6, 598) and Willstätter found the pentatomic C ring very stable. At  $180^\circ$  with excess H and Ni the tetratomic C ring is easily opened; with Pt this occurs easily at room temp. (*C. A.* 11, 34). Expt. on pinane, obtained by reducing pinene, having 2 satd. rings showed that the ring with 4 C atoms is not reduced under these conditions. Pinane may be regarded as a cyclobutane containing a 4- and a 6-atomic C ring. Cyclobutane-1,1-dicarboxylic acid (c), cyclobutanecarboxylic acid (d), its amide (e), cyclobutylamine (f), and cyclobutanol (g), were all prepd. and tested and found to be stable toward H in the presence of Pt at  $25^\circ$ . (c) was prepd. by the method of Perkin. (d) was obtained by distn. of (c). The chloride of (d) was obtained with  $PCl_5$  and converted into (e) by adding it drop by drop to satd.  $NH_3$  at  $0^\circ$ , and extg. the aq. soln. with  $Et_2O$ . (e) was converted into (f) by using NaOCl by Weerman's method (*C. A.* 12, 1462). The hydrochloride of (f) treated with a slight excess of  $AgNO_3$  in aq. soln. gave (g). Full exptl. details are given. E. J. WITZEMANN.

**Phenylurethans of terpenic alcohols and of phenols.**—F. WEGHUIZEN. Weltevreden, Java. *Rec. trav. chim.* 37, 266–9 (1918).—W. has prepd. several urethans of terpenic alcs. and phenols in a simple manner by dissolving the requisite amts. of the compds. in a mixt. of hydrocarbons (b. 170–200°) composed mostly of decane and undecane, and boiling the soln. This solvent has the several advantages: (1) the presence of H<sub>2</sub>O is excluded so that the formation of diphenylurea need not be feared; (2) the reagents are easily sol.; (3) the urethans are difficultly sol. and sep. as beautiful crystals on cooling. 0.500 g. *o*-cresol + 0.600 g. PhNCO in 6 cc. of the solvent gave after boiling 15 mins. and cooling nearly the calcd. amt. of the urethan, m. 141°. The *m*-deriv. (m. 121–2°) and *p*-deriv. (m. 112–3°) were similarly obtained. The phenylurethans of thymol, menthol and borneol, m. 106–7°, 111–2° and 137–8°, resp., were similarly obtained. For eugenol best results were obtained with benzine (b. 80–100°) in a closed flask at room temp. in a desiccator. If no excess of PhNCO is used camphor may be sepd. from borneol when the two are mixed in equal proportions. With geraniol and linalool the diphenylurea was obtained indicating that probably some H<sub>2</sub>O is split off during the reaction.

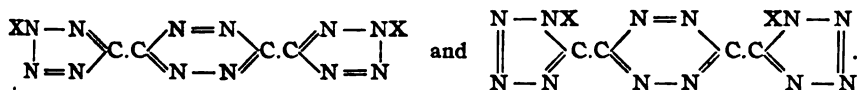
E. J. WITZEMANN.

**The action of hydrazine hydrate on cyanotetrazole.** J. LIFSCHITZ AND W. F. DONATH. Univ. Zurich. *Rec. trav. chim.* 37, 270–93 (1918).—L. showed (C. A. 9, 1614; 10, 1527) that cyanotetrazole and an EtOH soln. of NH<sub>2</sub>NH<sub>2</sub>·H<sub>2</sub>O react at the temp. of the H<sub>2</sub>O bath to give a yellow compd. (C<sub>2</sub>N<sub>4</sub>H<sub>4</sub>)<sub>x</sub> which was regarded as a deriv. of pentazole. Curtius, Darapsky and Müller (C. A. 10, 63) regarded it as the hydrazine salt of ditetrazyldihydropentazine (a) with which opinion L. and D. now agree, (a) was obtained from cyanotetrazole (b) prepd. (Oliveri-Mandalà and Passalacqua, *Gazz. chim. ital.* 41, 465, 1; C. A. 6, 625) by introducing (CN)<sub>2</sub> into aq. solns. of HN<sub>3</sub>. In their expts. in the prepn. of large amts. of (b) L. and D. made various observations. (b) was obtained purer the more dil. the HN<sub>3</sub> soln. was, but the yield falls with the diln. Theoretically a larger formation of bistetrazole and tetrazolecarboxamide occurs in more concd. HN<sub>3</sub> solns. The (b) formed at first will be exposed to the excess of azoimide and the reaction HN<sub>4</sub>CCN + HN<sub>3</sub> → HN<sub>4</sub>CCN<sub>2</sub>H will take place as well as HN<sub>4</sub>CCN + H<sub>2</sub>O → HN<sub>4</sub>CCONH<sub>2</sub>. An aq. soln. of HN<sub>3</sub> satd. with (CN)<sub>2</sub> and exposed to the light from a quartz Hg-vapor lamp gives a smaller yield of (b) than when it was exposed to diffuse sunlight which seems to favor the reaction. When the EtOH soln. of (b) is treated with NH<sub>2</sub>NH<sub>2</sub>·H<sub>2</sub>O a white turbidity is formed, which varies with the purity of the (b) used, and ppts. finally as 2 easily separable compds. One part is easily sol. in H<sub>2</sub>O and is mainly the hydrazine salt of bistetrazole (cf. also C., D. and M.). The insol. part is sol. in acids and is thought to be the hydrazine salt of tetrazolecarbohydrazidine, N<sub>2</sub>H<sub>4</sub>·HN<sub>4</sub>C·C(NH<sub>2</sub>):NNH<sub>2</sub> or N<sub>2</sub>H<sub>4</sub>·HN<sub>4</sub>CC(:NH)-NHNH<sub>2</sub>. This result is supported not only by the analyses of the salt, the free compd. after removal of N<sub>2</sub>H<sub>4</sub>, and of the Ag salt but also by the following reactions: (1) HNO<sub>3</sub> reacts with it to give bistetrazole which was identified by its compn. and that of its Ag salt: HN<sub>4</sub>C(NH<sub>2</sub>):NNH<sub>2</sub> + HNO<sub>3</sub> → HN<sub>4</sub>CCN<sub>2</sub>H + 2H<sub>2</sub>O. (2) With aldehydes like BzH, O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>CHO and anisaldehyde it gives condensation products HN<sub>4</sub>CC(:NH)NHN:CHR or HN<sub>4</sub>CC(:NNH<sub>2</sub>)N:CHR. (3) If this white substance is boiled with excess N<sub>2</sub>H<sub>4</sub>·H<sub>2</sub>O in EtOH yellow hydrotetrazine (c) is formed. The formation of (c) is interpreted from the beginning as follows: RCN + NH<sub>2</sub>NH<sub>2</sub> → RCC(:NH)NHNH<sub>2</sub>; RC(:NH)NHNH<sub>2</sub> + H<sub>2</sub>O → RCONHNH<sub>2</sub>. 2 mols. of the latter may condense to give aminotriazoles H<sub>2</sub>NN.(R)C:N.N:CR or hydrotetrazines

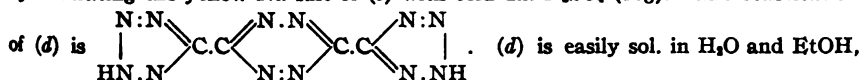
RC:N.NH.C(R):N.NH with the loss of 2 H<sub>2</sub>O mols. The interpretation of C., D.

and M. (l. c.) is opposed because dihydrotetrazine was not obtained on boiling the N<sub>2</sub>H<sub>4</sub> salt of the hydrazidine or the hydrazidine itself with an excess of tetrazolenitrile.

The (a) was more fully characterized by a series of salts and by the di-Et ether and by its transformation into the corresponding tetrazine. The latter furnishes 2 series of differently colored salts. The orange-red Na and K salts are easily sepd. into a yellow and a red-violet form. With the Ba salt the sepn. was incomplete while with the other salts and the di-Et ether only the red-violet form was obtained. Further study will show whether this is a case of true isomerism like



(b) was prepd. by satg. a cold aq. soln. of  $\text{HN}_3$  with  $(\text{CN})_2$ . This was placed in an ice box 24 hrs. and then concd. at  $55^\circ$  to a small vol.: a red color due to decompn. of cyanotetrazole should not appear. The concd. soln. solidifies *in vacuo* over  $\text{P}_2\text{O}_5$ . 2 g. (b) in 25 cc. EtOH were cooled and treated with 2.5 g.  $\text{NH}_2\text{NH}_2 \cdot \text{H}_2\text{O}$ . The white ppt. and its examn. were described above. The exptl. details are all given. 10 g. (a) were dissolved in 100 cc. warm  $\text{H}_2\text{O}$  and while boiling 50 cc. dil.  $\text{HCl}$  (1:1) were added. The free dihydrotetrazine (c) is pptd. quant.; yellow, compact, with 2 mols.  $\text{H}_2\text{O}$  of crystn., sol. in  $\text{H}_2\text{O}$ , EtOH,  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{C}_6\text{H}_6$  and ligroin. With  $\text{EtNO}_2$  (c) gives a red color and after some days is completely converted into ditetrazyltetrazine (d). 2 g. (a) in 50 cc. hot water were treated with a concd. soln. of  $\text{KCl}$  and a nearly quant. ppt. of the yellow *potassium salt* of ditetrazyl dihydrotetrazine was obtained. The *barium salt* was obtained similarly. 2 g. (a) in 50 cc.  $\text{H}_2\text{O}$  were treated in the cold with  $\text{AgNO}_3$  soln. and then heated to boiling, by which the pptd. *silver salt* was changed from dark yellow to light yellow. The Ag salt was treated with EtI and 20 cc. abs. EtOH and boiled 5 hrs. on a  $\text{H}_2\text{O}$ -bath. On cooling AgI sepd. and yellow plates of the *ethyl ether*, on evapg. the EtOH *in vacuo*; heated to  $120^\circ$  in the air it is oxidized to the red tetrazine ether, described below. Small amts. of ditetrazyl dihydrotetrazine (e) suspended in an excess of aq. soln. of  $\text{NaNO}_2$  and treated with concd.  $\text{HCl}$  gives a moderate yield of (d). 10 g. (e) were suspended in 150 cc. MeOH, treated with 10 cc.  $\text{EtNO}_2$  and kept on ice overnight. The addition of  $\text{EtNO}_2$  at 24-hr. intervals was repeated several times. This was the best method of prep. (d). (d) was also obtained by triturating the yellow Na salt of (c) with cold dil.  $\text{H}_2\text{SO}_4$  (1:3). The constitution



less sol. in  $\text{Et}_2\text{O}$  and when heated quickly it detonates. On heating (d) in EtOH soln. with a little mineral acid the red color disappears at once, gas is evolved and (c) seps. as beautiful, yellow crystals. Even on spontaneous evapn. of solns. of (d) auto-decompn. takes place and a brown, viscous product is formed, so that absence of acid and evapn. *in vacuo* are desirable. By the action of excess  $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$  or  $\text{NH}_3$  in EtOH (d) is converted into (c). 2 g. (e) suspended in 10 cc.  $\text{H}_2\text{O}$  were treated with just enough concd.  $\text{Na}_2\text{CO}_3$  to dissolve the (a) with warming. After filtering a concd. soln. of  $\text{NaNO}_2$  was added and finally the mixt. was acidified with glacial AcOH. On standing in the cold the orange-red *sodium salt* of (d) sepd. In 80% EtOH this salt is only partly sol.: the residue is yellow and the red-violet soln. seps. a violet salt. When the yellow salt is dissolved in  $\text{H}_2\text{O}$  and pptd. with EtOH or  $\text{Et}_2\text{O}$  the violet salt is pptd. Free (d) treated in concd. EtOH soln. with the calcd. amt. of  $\text{NaOEt}$  gives the same Na salt. 1 g. (e) in 5 cc.  $\text{H}_2\text{O}$  was treated with the calcd. amt. of  $\text{KNO}_2$  in a little  $\text{H}_2\text{O}$  and then acidified with glacial AcOH. The orange-red *potassium salt* of (d) seps. at once. It can be sepd. into an orange and a violet fraction as with the Na salt. 0.5 g. of the Na salt of (d) dissolved in 20 cc.  $\text{H}_2\text{O}$  was treated while boiling with a soln. of  $\text{BaCl}_2$ : orange microcrystals of the *barium salt* of (d) sepd. at once. The treat-

ment with  $H_2O$  did not cause a good sepn. of 2 forms. It explodes with extreme violence when heated. 1 g. of the Na salt in 50 cc. boiling  $H_2O$  is treated drop by drop with  $AgNO_3$  and after a long time the dark violet *silver salt* of (d) is pptd.; it explodes at  $150^\circ$ . It may also be prepd. from (a) with  $AgNO_3$  and  $HNO_3$ . The  $HNO_3$  oxidizes the hydrotetrazine. The ether of (d) could not be obtained from EtI and the Na salt but it was obtained from  $Me_2SO_4$  and the Na salt. 1.5 g. of the Ag salt boiled with EtI for 0.5 hr. and then treated with 30 cc. abs. EtOH gave on cooling and evap. after filtering off AgI beautiful, red crystals of the *ethyl ether* of (d). On passing  $NH_3$  gas through an ice-cooled soln. of (d) the *ammonium salt* of (d) seps. as a red-violet microcryst. powder; the salt m.  $275^\circ$ . 1.5 g. (d) in 20 cc. EtOH were treated carefully with a dil. EtOH soln. of  $N_2H_4 \cdot H_2O$ . Addition was stopped before the soln. was completely decolorized. The red-violet *hydrazine salt* of (d), is decolorized at  $190^\circ$  and m.  $210^\circ$ .

E. J. WITZEMANN.

**The action of fumaryl chloride on fumaric acid.** G. C. A. VAN DORP AND P. J. MONTAGNE. Leyden. *Rec. trav. chim.* 37, 294-302(1918).—W. A. and G. C. A. van Dorp (*Rec. trav. chim.* 25, 96(1906)) treated fumaric acid with fumaryl chloride at  $175^\circ$  and sepd. maleicanhydride from the product by boiling with  $C_6H_6$ . Pure fumaric anhydride was not sepd. By boiling with  $PhNH_2$  fumaranilic acid was obtained which indicates that fumaric acid was present as the anhydride, polymeric anhydride or mixed chloride anhydride. This work has been repeated and extended. A mixt. of 4 g. fumaric acid and 6 g. fumaryl chloride were heated in an oil bath  $160-2^\circ$  until 1.33 g. HCl (about 0.5 of the calcd. amt.) had been evolved. After cooling  $C_6H_6$  was added and rapidly heated to boiling. The next day the product was filtered and washed with  $C_6H_6$ : product A. The residue was boiled with 1 l.  $C_6H_6$  and filtered hot: product B. The residue was product C. A was treated with 20 cc.  $PhNH_2$  in 100 cc.  $C_6H_6$  and boiled 0.5 hr. and filtered the next day. The ppt. was washed with cold  $H_2O$  to remove  $PhNH_2 \cdot HCl$ . The part insol. in alkali was recrystd. from AcOH. 3.6 g. fumardianilide (a), m.  $309^\circ$ . The alk. soln. acidified with HCl gave 3.7 g. maleinanilic acid (b), m.  $185^\circ$ . 1.8 fumaric acid was recovered from the alc. soln. in which (b) was recrystd. (b) is formed from maleic anhydride by a mol. transformation of 1 mol. fumaryl chloride acting on 2 mols. fumaric acid with the liberation of 2 mols. HCl. (a) is probably mainly formed from unattacked fumaryl chloride. B treated with  $PhNH_2$  as with A gave finally 0.20 g. (a) and 0.25 g. (b). These 2 products may have arisen from a product formed thus:  $ClOC.(CH)_2.COC(=O)H + HOOC.(CH)_2.COOH \rightarrow ClOC.(CH)_2.C(=O).O.CO.(CH)_2.COOH$  (I) + HCl and (I) +  $ClOC.(CH)_2.COC(=O)H \rightarrow ClOC.(CH)_2.C(=O).O.CO.(CH)_2.C(=O).O.CO.(CH)_2.COC(=O)H$  (II) + HCl. (II) may react with 4 mols.  $PhNH_2$  to give 2 mols. of (b) and 1 mol. of (a), which was about the ratio found with B. C treated with  $PhNH_2$  as with B gave finally 0.20 g. (a), 0.22 g. (b), 0.70 g. impure fumaranilic acid and 0.57 g. impure fumaric acid. (II) could not have been present in C but it might have contained (I) and the  $PhNH_2$  derivs. found could have been formed from it. Other details not represented here are given.

E. J. WITZEMANN.

**Tetrahydronaphthalene series.** ARTHUR G. GREEN AND FREDERICK M. ROWE. *J. Chem. Soc.* 113, 955-73(1919).—The derivs. of ar-tetrahydro- $\alpha$ -naphthylamine, ar-tetrahydro- $\alpha$ -naphthol and  $\alpha$ -chloro-ar-tetrahydronaphthalene corresponding to the more important dye intermediates in the  $C_6H_5$  and  $C_{10}H_7$  series have been made in order to det. whether they might be of practical use in the prepn. of new dyes. In general, they are of no comm. value. A review of the literature on the properties of ar-tetrahydro- $\alpha$ -naphthylamine (A) shows that in certain reactions it is like an amine of the  $C_6H_5$  series, in other reactions like an amine of the  $C_{10}H_7$  series. The azo dyes derived from (A) approximate more closely in shade the dyes from benzenoid amines

rather than those from  $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ . The hydrochloride of (A) is obtained in 70% yields when  $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$  is treated with boiling AmOH and Na, then poured into  $\text{H}_2\text{O}$ , the AmOH layer sepd. and acidified with HCl, the alc. steam distd. and the aq. soln. of the hydrochloride, after filtration, evapd. to dryness. Traces of ac-tetrahydro- $\alpha$ -naphthylamine are also formed. Neither EtOH nor BuOH can be used. As BuOH even under pressure or with a catalyzer such as Na-Hg,  $\text{Hg}_2\text{Cl}_2$ , Ni or dextrose gives no results, the reduction is probably connected with the oxidation of the AmOH. Tetrahydroaceto- $\alpha$ -naphthalide (B) (*J. Chem. Soc.* 85, 737) treated with  $\text{HNO}_3$  (1 mol.) and 100%  $\text{H}_2\text{SO}_4$  at  $-10^\circ$  gives 4-nitro-ar-tetrahydroaceto- $\alpha$ -naphthalide (C), colorless needles from dil. alc. or  $\text{H}_2\text{O}$ , m.  $178^\circ$ . By reduction of (C) with Fe and HOAc, 1-acetyl-ar-tetrahydro-4-naphthylenediamine (D) results, colorless plates or needles from  $\text{Et}_2\text{O}$ , m.  $291^\circ$ , which readily diazotizes and couples with amines and phenols. (C) with alc. NaOH gives 4-nitro-ar-tetrahydro- $\alpha$ -naphthylamine (E), yellow needles from dil. alc., m.  $116^\circ$ . (E) with alc. HCl forms a hydrochloride, colorless needles decompd. by  $\text{H}_2\text{O}$ ; (E), in  $\text{C}_6\text{H}_6$  treated with alc. KOH, on evapn. gives the orange-red K salt  $\text{NH}\cdot\text{C}_{10}\text{H}_{10}\cdot\text{NO}_2\cdot\text{K}$ . (E) is readily diazotized and coupled to form azo dyes similar in appearance and shade to those obtained from *p*-nitroaniline. (E) with  $\text{SnCl}_2$  gives ar-tetrahydro-1,4-naphthylenediamine (F), isolated as the diacetate (G), colorless needles from HOAc, m.  $291^\circ$ . (F) in HCl treated with  $\text{CrO}_3$ , then extd. with  $\text{Et}_2\text{O}$ , gives tetrahydro- $\alpha$ -naphthoquinone (H), yellow needles from petroleum, m.  $55^\circ$  (*Ber.* 23, 1132). (B) with  $\text{HNO}_3$  (2 mol.) and 100%  $\text{H}_2\text{SO}_4$  at  $-10^\circ$  gives 2,4-dinitro-tetrahydroaceto- $\alpha$ -naphthalide (I), colorless needles from alc., m.  $202^\circ$ . Further nitration of (C) also gives (I). Upon triturating (I) with a little  $\text{H}_2\text{O}$ , then dissolving in  $\text{H}_2\text{SO}_4$  and warming, 2,4-dinitro-ar-tetrahydro- $\alpha$ -naphthylamine (J) forms, yellow needles from alc., m.  $181^\circ$ . The K salt of (J) is a bluish green powder formed by evapn. of a mixt. of a  $\text{C}_6\text{H}_6$  soln. of (J) and alc. KOH. When ar-tetrahydro- $\alpha$ -naphthol (K) (*Ber.* 21, 1892) is treated with cold concd.  $\text{H}_2\text{SO}_4$  for 2 days ar-tetrahydro- $\alpha$ -naphthol-sulfonic acid (L) is obtained and isolated as the Na salt, colorless efflorescent needles. Upon dissolving (K) in cold  $\text{H}_2\text{SO}_4$ , allowing to remain 2 days, then dilg. and adding dil.  $\text{HNO}_3$  (1 mol.), 2-nitro-ar-tetrahydro- $\alpha$ -naphthol-4-sulfonic acid (M) is obtained, yellow needles, m.  $182^\circ$ , crystd. by dissolving in  $\text{H}_2\text{O}$  and adding HCl. Dil.  $\text{H}_2\text{SO}_4$  hydrolyzes (M) to 2-nitro-ar-tetrahydro- $\alpha$ -naphthol (N), yellow needles from  $\text{Et}_2\text{O}$ , m.  $56^\circ$ . (N) forms with NaOH a Na salt, orange plates from  $\text{H}_2\text{O}$ , and also couples with diazonium compds. to form azo dyes. If (K) is dissolved in NaOH and treated with  $\text{NaNO}_2$  (2 mol.), then acidified with  $\text{H}_2\text{SO}_4$ , 4-nitro-ar-tetrahydro- $\alpha$ -naphthol (O) forms, yellow needles from dil. alc., m.  $163^\circ$ . (O) differs from (N) in that it does not couple with diazonium compds. 2,4-Dinitro-ar-tetrahydro- $\alpha$ -naphthol (P) forms yellow prisms from  $\text{Et}_2\text{O}$ , m.  $105^\circ$ . It is made by nitration of (K) with  $\text{H}_2\text{SO}_4$  and 2 mol. dil.  $\text{HNO}_3$ , first cold, then warmed to  $50^\circ$ ; it is also produced by further nitration of (N) or (O) or of diazotetrahydronaphthalene-4-sulfonic acid. Sulfur dyes formed from (P) are valueless. Diazotization of (A) and treatment with HCl and CuCl give  $\alpha$ -chlorotetrahydronaphthalene (Q), colorless liquid,  $b_{748}^{250^\circ}$ , and tetrahydronaphthalene as by-product. Cold concd.  $\text{H}_2\text{SO}_4$  and  $\text{HNO}_3$  (2 mols.) with (Q) give 1-chloro-2,4-dinitro-ar-tetrahydronaphthalene, (R), colorless needles from petroleum, m.  $68^\circ$ . The halogen in (R) is not active as it is in 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_2\text{Cl}$ . An alc. soln. of (A), 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_2\text{Cl}$  and a little NaOAc when refluxed gives 2,4-dinitrophenyl-ar-tetrahydro- $\alpha$ -naphthylamine red leaflets from alc., m.  $134^\circ$ . 2,4-( $\text{O}_2\text{N}$ ) $_2\text{C}_6\text{H}_2\text{Cl}$  also condenses with ac-tetrahydro- $\alpha$ -naphthylamine, to give 2,4-dinitrophenyl-ac-tetrahydro- $\alpha$ -naphthylamine, yellow plates from alc., m.  $121^\circ$ . ROGER ADAMS.

The *N*-butylarylamines. I. The action of *n*-butyl chloride on *o*- and *p*-toluidine. JOSEPH REILLY AND WILFRED J. HICKINBOTTOM. *J. Chem. Soc.* 113, 974-85(1919).

—BuCl (A) reacts with *p*-toluidine to give sec. and tert. arylamines; with *o*-toluidine, however, to give *o*-MeC<sub>6</sub>H<sub>4</sub>NHBu exclusively, although methylation under the same conditions gives a di-Me deriv. The properties of the various derivs. of mono-butyl-*o*- and *p*-toluidines are compared. BuOH and *p*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>·HCl give at 140° a sec. amine but at a higher temp. complex primary and sec. amines, the structures of which were not detd. BuOH and PhNH<sub>2</sub>·HCl at 200° gives chiefly PhNHBu (*J. Chem. Soc.* 113, 102) but at 240–80° chiefly *p*-BuC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> and higher butylated products. Crude *p*-MeC<sub>6</sub>H<sub>4</sub>NHBu (B) b. 250–60° and crude *p*-MeC<sub>6</sub>H<sub>4</sub>NBu<sub>2</sub> (C) b. above 260°, are obtained by heating *p*-toluidine (1 mol.) and BuCl (2.5 mols.) 60–80 hrs., distg. the excess of (A), making alk. with aq. NaOH, extg. with Et<sub>2</sub>O, pptg. unchanged *p*-toluidine with ZnCl<sub>2</sub> soln. and fractionating the products. Crude (B) with HCl and NaNO<sub>2</sub> gives *p*-tolylbutylnitrosoamine (D), pale yellow oil. Crude (D) with concd. HCl and Zn dust on a H<sub>2</sub>O bath gives *butyl-p-toluidine* (E), *b*<sub>710</sub> 264–5°; *hydrochloride*, colorless needles, m. 150–1°, from (E) in C<sub>6</sub>H<sub>6</sub> and gaseous HCl. *Oxalate*, white plates, m. 185°; *picrate*, red oil. Ac<sub>2</sub>O and (E) give *acetobutyl-p-toluidide* (F), pale yellow oil, *b*<sub>710</sub> 294–5°. *Benzobutyl-p-toluidide* is a yellow oil, b. above 380°. Pure (C), *b*<sub>714</sub> 282–4°, can be obtained by fractionation of the crude material, or from the crude mixt. of (B) and (C) by treating with HNO<sub>3</sub>, extg. with Et<sub>2</sub>O the (D) which seps. and making alk. *Ferrocyanide*, white powder; *picrate*, yellow crystals from Et<sub>2</sub>O, m. 109–10°. By the action of BuCl on *o*-toluidine in the same way as it was allowed to react with *p*-toluidine, *butyl-o-toluidine* (G) is produced, colorless oil, *b*<sub>711</sub> 258–60°, but no dibutyl-*o*-toluidine is formed. (G) gives an *acetyl derivative* (H), colorless oil, forms with HNO<sub>3</sub> *o*-tolylbutylnitrosoamine (I), a yellow oil. (I) in Et<sub>2</sub>O with alc. HCl gives *5-nitrosobutyl-o-toluidine hydrochloride* (J), green-yellow powder, decomp. 136° (J) with dil. NH<sub>4</sub>OH gives *5-nitrosobutyl-o-toluidine*, blue needles from Et<sub>2</sub>O-petr. ether, m. 50°. (J) forms with CuCl<sub>2</sub> a *cuprichloride*, green crystals; (J) decomp. with alkali to give 5-nitroso-*o*-cresol and BuNH<sub>2</sub>. BuOH (1.3 mol.) with PhNH<sub>2</sub>·HCl (1 mol.) is heated at 240° for 7–8 hrs., made alk., the fraction, b. 255–65°, changed to an insol. sulfate and then again made alk., which gives pure *p*-aminobutylbenzene (K), *b*<sub>710</sub> 258–60°. Pure (B) treated with diazotized sulfanilic acid gives a mixt. of diazoamine and azo compds. Pure *sodium 4-methyl-N-butyl-diazoaminobenzene-4'-sulfonate* (L) can be isolated by carrying out the diazotization in alc., adding satd. NaOAc, evapg. on the H<sub>2</sub>O bath, converting into the free base with H<sub>2</sub>SO<sub>4</sub>, extg. with Et<sub>2</sub>O and finally treating in alc. with alc. KOH. It is a red powder. II. Nitration of mono- and di-*n*-butyl-*p*-toluidines. *Ibid* 985–95. —*p*-MeC<sub>6</sub>H<sub>4</sub>NHBu (A) in concd. H<sub>2</sub>SO<sub>4</sub> with HNO<sub>3</sub> (1 mol.) at a low temp. gives *2-nitrobutyl-p-toluidine sulfate* (B), white plates from abs. alc., m. 152°. Both HCl and HBr salts of (B) are white solids. The free base is a red oil and gives with Ac<sub>2</sub>O *2-nitroacetobutyl-p-toluidide* (C), yellow needles, m. 48°. (B) in glacial AcOH with NaNO<sub>2</sub> forms *2-nitro-p-tolylbutylnitrosoamine* (D), a pale yellow oil. By the action of HNO<sub>3</sub> in AcOH on *p*-MeC<sub>6</sub>H<sub>4</sub>NBuAc, *3-nitroacetobutyl-p-toluidide* (E) is produced, yellow crystals from alc., m. 68°. (E) is hydrolyzed by dil. H<sub>2</sub>SO<sub>4</sub> to *3-nitrobutyl-p-toluidine* (F), a red oil. (A) in AcOH with HNO<sub>3</sub> (d. 1.5) gives *3,5-dinitrobutyl-p-toluidine* (G), orange needles from MeOH, m. 53°. (G) with Ac<sub>2</sub>O forms *3,5-dinitroacetobutyl-p-toluidide* (H), pale yellow needles from petr. ether and acetone, m. 55°. (G) with HNO<sub>3</sub> in AcOH forms *3,5-dinitro-p-tolylbutylnitrosoamine* (I), yellow plates from MeOH, m. 56°. (I) is also obtained by very vigorous nitration of (A) or by nitrating at a low temp. *p*-MeC<sub>6</sub>H<sub>4</sub>N(NO)Bu (J) (see preceding abstract). If (J) is nitrated at a higher temp. or with HNO<sub>3</sub> (d. 1.5), *3,5-dinitro-p-tolylbutylnitrosoamine* (K) forms, yellow needles from 80% alc., m. 95°. The free base of (B) with HNO<sub>3</sub> (d. 1.5) gives *2,3,5-trinitro-p-tolylbutylnitrosoamine* (L), white needles, m. 87°.



(B) with  $\text{HNO}_3$  (d. 1.4) and  $\text{H}_2\text{SO}_4$  gives 2,3,5-trinitro-*p*-tolylbutyl-nitrosoamine (M), yellow crystals from dil. alc., m.  $80.5^\circ$ .  $p\text{-MeC}_6\text{H}_4\text{NBu}_2$  on nitration in glacial AcOH gives (I), showing that one Bu group has split off during the reaction. In concd.  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$  (1 mol.) converts  $p\text{-MeC}_6\text{H}_4\text{NBu}_2$  into 2-nitrodibutyl-*p*-toluidine (N), a red oil; its hydrochloride forms white crystals. Further nitration of (N) produces (M), thus showing the position of the  $\text{NO}_2$  group in (N) to be ortho to the Me group.

ROGER ADAMS.

Phenylsuccinic acid series. VII. The action of alcohols and amines on  $\gamma$ -diphenylsuccinic anhydride. HENRY WREN AND HOWELL WILLIAMS. Municipal Tech. Inst., Belfast. *J. Chem. Soc.* 113, 832-40(1918).—This investigation was undertaken to ascertain whether derivs. of mesodiphenylsuccinic acid are produced during the reaction of alcs. or amines with  $\gamma$ -diphenylsuccinic anhydride (A). The action of (A) on Me and Et alcs., on  $\text{PhNH}_2$  and *p*-toluidine were therefore studied. In the case of EtOH the main product formed was the monoethyl ester of  $\gamma$ -diphenylsuccinic acid and also a small quantity of Et mesodiphenylsuccinate. With MeOH Me  $\gamma$ -diphenylsuccinate was the only product obtained.  $\text{PhNH}_2$  yielded  $\gamma$ -diphenylsuccin-anilic acid only. The latter compd. was converted into diphenylsuccin-anil either by means of EtOH-HCl or heat. *p*-Toluidine, in  $\text{C}_6\text{H}_6$  soln. reacted very readily with (A) and  $\gamma$ -diphenylsuccino-*p*-toluidic acid, m.  $194-5^\circ$ , was the main product of the reaction. However, a small quantity of another compd. m.  $206^\circ$  (decompn.), was also obtained, which the author supposed to be the meso deriv.

MAX PHILLIPS.

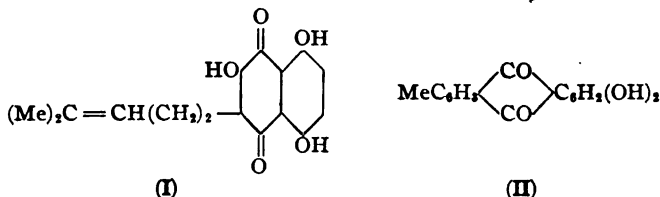
Synthesis of ketones of the thiophene series. V. THOMAS AND V. COUDERC. *Bull. soc. chim.* 23, 288-91(1918).—T. had previously (cf. *Bull. soc. chim.* [4] 5, 730) shown that thienyl magnesium iodide (A) behaves in many reactions like  $\text{PhMgI}$ . In continuing this phase of the work, the author found that nitrites of certain aliphatic and aromatic acids react with (A), yielding ketones. Thus EtCN yields ethyl thienyl ketone,  $\text{C}_6\text{H}_5\text{COC}_2\text{H}_5\text{S}$ ,  $b_{25}$  128-9; PhCN yields phenyl thienyl ketone colorless needles, m.  $55^\circ$ , oxime m.  $80^\circ$ .  $\alpha$ - and  $\beta$ -Naphthyl thienyl ketone,  $b_{25}$  187-8 $^\circ$  and m.  $87^\circ$ , resp., were similarly obtained, using the corresponding nitriles. Dithienyl ketone was obtained through the action of ClCN and (A), colorless needles, m.  $87-8^\circ$ . M. P.

A new method of synthesis of acetylaminophenol ethers. R. KITAMURA. Tokyo. *Kwagaku Kwaishi* (*J. Tokyo Chem. Soc.*) 39, 1121-30(1918); *J. Pharm. Soc. Japan* 1918, No. 442, 971.—Phenacetin and allied substances are usually prepd. by the action of acids on the aminophenol ethers. K.'s method consists in allowing acid amides to react with halogen-substituted phenol ethers in the presence of Cu as in the condensation of  $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$  and  $\text{PhNH}_2$  proposed by Ullmann. K. prepd. phenacetin, metacetin, *p*-benzoylphenacetin and acetanilide from *p*-chloro- or bromophenol ether, *p*-bromoanisidine, *p*-bromophenetole and PhBr with  $\text{AcNH}_2$  and  $\text{BzNH}_2$ . Cu powder,  $\text{CuCl}_2$ ,  $\text{Cu}_2\text{Cl}_2$ ,  $\text{CuBr}_2$ ,  $\text{Cu}_2\text{Br}_2$ ,  $\text{CuSO}_4$ ,  $\text{ZnCl}_2$ ,  $\text{ZnSO}_4$  can be used as catalyst instead of mol. Cu.

S. KOMATSU.

The coloring matter in *Lithospermum erythrorhizon*. C. KURODA. Tokyo. *Kwagaku Kwaishi* (*J. Tokyo Chem. Soc.*) 39, 1051-1115(1918).—Shikon means purple root; it is the root of *Lithospermum erythrorhizon*, which was formerly used in Japan for dyeing a purple color. The coloring matter found in the root bark in the form of an Ac compd. was first studied by Kuhara (*J. Chem. Soc.* 35, 22-5(1879)) who ascribed to it the formula  $\text{C}_{20}\text{H}_{16}\text{O}_{10}$ . Kuroda, however, has isolated the substance in cryst. form of reddish brown color from its cold  $\text{C}_6\text{H}_6$  ext., has proved it has the formula  $\text{C}_{20}\text{H}_{16}\text{O}_8$  by its analysis and mol. wt. detn. and named it shikonine. Shikonine is best represented by Formula I; the evidence in support of this view is as follows: (1). It contains three HO groups since it yields  $\text{C}_{18}\text{H}_{14}\text{O}_8\text{Ac}_3$ , yellow needles, m.  $113^\circ$ ,  $\text{C}_{18}\text{H}_{14}\text{O}_8\text{Bz}_3$ , yellow crystals, m.  $168^\circ$ ,  $\text{C}_{18}\text{H}_{14}\text{O}_8\text{Cu}$  and  $\text{C}_{18}\text{H}_{14}\text{O}_8\text{Na}_3$ , and also a penta-Ac compd.,

m. 90° in the presence of Zn dust. (2). By dry distn., shikonine is transformed into  $\alpha$ -methylquinazarin (II), reddish brown needles, m. 232°; di-Ac compd.  $C_{14}H_8O_4Ac_2$ , m. 217°, which was identified with the substance synthesized from  $\alpha$ -methylphthalic anhydride and dimethylquinol by Lagodziuski's method (*Ber.* 28, 116(1895)). (3). (I) and (II) yield by Zn dust distn.  $\alpha$ - and  $\beta$ -methylantracene. By oxidation with



alk.  $KMnO_4$ , (I) yields malonic, fumaric and succinic acids and (II)  $\alpha$ -methylphthalic acid, resp. (4). (I) and (II) resemble in their absorption spectra and behavior on reduction naphthazarin and alizarin, resp. (5). Shikonine yields a monoxime, m. 163° and its Ac compd. by the action of  $O_3$  is decompd. into  $Me_2CO$  and 1,4-dihydroxyphthalic acid, m. 223°.

S. KOMATSU.

**Cinchona alkaloids. I. Cupreine, hydrocupreine and their methyl and ethyl ethers.** G. GIEBMSA AND J. HALBERKANN. *Inst. Schiffs- u. Tropenkrankh., Hamburg. Ber.* 51, 1825-33(1918).—Cupreine (a), obtained from the crude basic sulfate by removing accompanying alkaloids in alk. soln. by means of  $Et_4O$ , converting into the neutral sulfate, then into the hydrochloride and decompd. with  $NH_4OH$ , seps. from dil. alc. in prismatic tablets without  $H_2O$  of crystn., m. 201-2°, from  $Et_2O$  in druses of prismatic needles or tablets, m. 187°, become devitrified when covered with abs. alc., m. 202° after long drying at 125°,  $\alpha_D^{20}$  -174.4° (EtOH),  $\alpha_D^{23}$  -175.7° (MeOH), gives with Cl and Br  $H_2O$  only a faint yellow color gradually becoming greener and developing a blue fluorescence. Basic sulfate, needles without  $H_2O$  of crystn. from hot MeOH or AmOH, sol. in boiling  $H_2O$  with yellow color, m. 257° (decompn.). No salt with 6 mols.  $H_2O$ , as described by Hesse (*Ann.* 230, 59) and by Oudemann (*Rec. trav. chim.* 8, 147(1889)), could be obtained. Neutral sulfate, from  $H_2O$  in large, somewhat yellowish, prismatic tablets with 2 mols.  $H_2O$ , 1 of which is quickly lost at 100° or in 24 hrs. over  $H_2SO_4$ , becoming devitrified and rapidly reabsorbing the  $H_2O$  in the air. The 2nd mol. is completely lost only at 130-40°, the crystals crumbling to a S-yellow powder. A 1% soln. gives with  $FeCl_3$  a brown-red color with a violet cast,  $\alpha_D^{22}$  -197.9° ( $H_2O$ ). (a) is readily reduced to hydrocupreine (b) in the presence of 1% Pd pptd. on  $CaCO_3$  or purified infusorial earth, the reduction of 1 g. (a) with 2 g. catalyzer in 20 cc. alc. being complete in 20 min. at room temp. and atm. pressure. The reduction of (a)-HCl can also be effected with Kelber's 10% Ni catalyzer on infusorial earth (*C. A.* 10, 897), 1 g. (a) in 50 cc.  $H_2O$  with 5 g. catalyst requiring 30 min. (b) seps. from dil. alc. in needles, m. 204° (Hesse, *Ann.* 241, 281, and Pum, *Monatsh.* 16, 68, give 170°),  $\alpha_D^{20}$  -154.8° (alc.), shows no fluorescence in  $HNO_3$ , behaves like (a) towards  $NH_4OH$  and Cl or Br  $H_2O$ . Basic sulfate, long, fine needles. Neutral sulfate, faintly yellow octahedrons from  $H_2O$ , long, prismatic needles from aq.  $Me_2CO$ , both with 4  $H_2O$ , which is quickly lost over  $H_2SO_4$ , sol. in hot  $H_2O$  with yellow color; anhydrous, it m. 203° and takes up 1 mol.  $H_2O$  in the air. The (b) obtained as above and various com. samples, which were naturally prepd. from hydroquinine, all instantly decolorized acid  $KMnO_4$ ; H.'s statement that (b) is very stable towards  $KMnO_4$  is therefore erroneous. Methylcupreine (quinine), from (a) with alk.  $Me_2SO_4$  in MeOH or with  $CH_2N_2$  in AmOH, was identified through the basic sulfate which loses all of its  $H_2O$ , though slowly towards the last, at 120°, and reabsorbs 2 mols. in the air. Methylhydrocupreine, obtained from the above ether by catalytic reduction, or from (b) and

$\text{CH}_3\text{N}_3$ , analyzed as the sulfate which after 24 hrs. in the air contains 6 mols.  $\text{H}_2\text{O}$ ; the dehydrated salt reabsorbs 4 mols. in 24-48 hrs. Ethylcupreine from the Na salt of (a) and  $\text{Et}_2\text{SO}_4$ , pptd. by  $\text{NH}_4\text{OH}$  with 1 mol.  $\text{H}_2\text{O}$ , obtained pure by fractional pptn. from  $\text{Et}_2\text{O}$  with petr. ether, m.  $165-6^\circ$ ,  $\alpha_D^{20} -158.9^\circ$  (alc.); basic sulfate, fine, felted, flat, prismatic needles with 1  $\text{H}_2\text{O}$  which is very quickly reabsorbed after drying; neutral sulfate, prisms with 7 mols.  $\text{H}_2\text{O}$ ; anhydrous, it softens  $160^\circ$ , m.  $163-4^\circ$ , absorbs 2 mols.  $\text{H}_2\text{O}$  in the air. Ethylhydrocupreine, obtained by reduction of ethylcupreine or ethylation of (b), pptd. by  $\text{NH}_4\text{OH}$  in flocks with 1  $\text{H}_2\text{O}$ , sinters  $122^\circ$ , m.  $130^\circ$ ,  $\alpha_D^{20} -144.3^\circ$  (alc.); basic hydrochloride, identical with the com. "optochin," basic sulfate, long, prismatic needles with 4  $\text{H}_2\text{O}$ , m.  $235^\circ$  (anhydrous), reabsorbs 1-2 mols.  $\text{H}_2\text{O}$ , depending on the humidity, forms a blue-green to blue soln. in boiling  $\text{H}_2\text{O}$ ; neutral sulfate, large prisms with 7  $\text{H}_2\text{O}$ , quickly weathering. C. A. R.

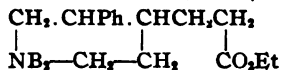
**Synthesis of curcumin.** V. LAMPE. *Ber.* 51, 1347-55(1918); cf. C. A. 7, 3333.—Ethyl  $\alpha$ -carbomethoxyferuloylacetate (a), 3,4-MeO(MeO<sub>2</sub>CO) $\text{C}_6\text{H}_3\text{CH}:\text{CH}\cdot\text{COCHAcCO}_2\text{Et}$ , faintly yellow needles from alc., m.  $91-3^\circ$ , is obtained by adding to 2.4 g.  $\text{AcCH}_2\text{CO}_2\text{Et}$  and 1.25 g. powdered  $\text{NaOEt}$  which have been allowed to stand a long time in 50 cc.  $\text{Et}_2\text{O}$  in a freezing mixt. a suspension of 5 g. carbomethoxyferuloyl chloride in 50 cc.  $\text{Et}_2\text{O}$ , heating 2 hrs. on the  $\text{H}_2\text{O}$  bath, dissolving the  $\text{NaCl}$  formed in a little  $\text{H}_2\text{O}$  and evapg. the  $\text{Et}_2\text{O}$  layer. It dissolves in concd.  $\text{H}_2\text{SO}_4$  with yellow color and gives a yellow color with alc.  $\text{FeCl}_3$ . Shaken in  $\text{Et}_2\text{O}$  with 1%  $\text{NaOH}$  (a) quickly forms a red soln. from which  $\text{CO}_2$  ppts. the *q-hydroxy compound*, canary-yellow prismatic needles from alc., m.  $116-8^\circ$ , is colored red by concd.  $\text{H}_2\text{SO}_4$  and forms an orange soln. In the prepn. of (a) is also formed a by-product, carbomethoxyferulic anhydride,  $[\text{MeO}(\text{MeO}_2\text{CO})\text{C}_6\text{H}_3\text{CH}:\text{CHCO}]_2\text{O}$ , leaflets from alc., m.  $142-4^\circ$ . In the condensation of  $\text{PhCH}:\text{CHCOCl}$  with  $\text{AcCH}_2\text{CO}_2\text{Et}$  there is likewise formed as by-product cinnamic anhydride, prisms from alc., m.  $138^\circ$ . (a) on sapon. and simultaneous elimination of  $\text{CO}_2$  gives in good yield carbomethoxyferuloylacetone (b), faintly yellow, prismatic needles from alc., m.  $111-3^\circ$ , colored orange by concd.  $\text{H}_2\text{SO}_4$  and forming a yellow soln. with greenish cast; dil. alkalies split off the  $\text{MeO}_2\text{CO}$  group,  $\text{CO}_2$  pptg. the *hydroxy compound*, prisms from ligroin, m.  $143-5^\circ$ , colored red by concd.  $\text{H}_2\text{SO}_4$  and giving an orange soln., darkened by alc.  $\text{FeCl}_3$ . When 2 g. (b) in 15 cc. anisole allowed to stand 1 day at room temp. with 0.15 g. Na dust is treated with a still warm soln. of 1.85 g. carbomethoxyferuloyl chloride in 20 cc. anisole, allowed to stand 24 hrs., treated with a little acidified ( $\text{HCl}$ )  $\text{H}_2\text{O}$  and freed from anisole with steam there remains a heavy, dark red oil solidifying after a time to a cake probably consisting of dicarbomethoxydiferuloylacetone; 2 g. of this is boiled 1 hr. with 25 cc.  $\text{AcOH}$  and 15 cc.  $\text{H}_2\text{O}$  and on long standing the crimson soln. deposits 0.3 g. of dicarbomethoxydiferuloylmethane (c), obtained after repeated, very careful recrystn. from  $\text{C}_6\text{H}_6$  in large, faintly orange prisms, m.  $170-2^\circ$ , colored orange-red by  $\text{H}_2\text{SO}_4$  and giving a soln. of the same color and with faint red fluorescence. The faintly greenish fluorescent alc. soln. becomes dirty brown on addition of  $\text{FeCl}_3$  while basic Pb acetate or  $\text{Cu}(\text{OAc})_2$  produces no color or ppt. A comparison of (c) with dicarbomethoxycurcumin (C. A. 4, 2831) showed that the latter is a mixt. of isomers, careful crystn. from  $\text{C}_6\text{H}_6$  raising the m. p. from  $150^\circ$  to  $170-2^\circ$  and yielding a product identical with (c). When 0.5 g. (c) moistened with 5 cc.  $\text{Me}_2\text{CO}$  is treated in a H atm. with 3 cc. of 2 N  $\text{KOH}$ , warmed 1 hr. at  $50^\circ$ , dild. with 100 cc.  $\text{H}_2\text{O}$ , pptd. with  $\text{CO}_2$  and, after a time, with 60 cc. of 1%  $(\text{CO}_2\text{H})_2$ , filtered and recrystd. twice from  $\text{C}_6\text{H}_6$  and then repeatedly from  $\text{MeOH}$  there are obtained prisms, m.  $180-3^\circ$ , of *diferuloylmethane*, identical with natural curcumin, the constitution of which is thereby established. CHAS. A. ROUILLER.

**Synthesis of *p,p'*-dihydroxy- and *p*-hydroxydicinnamylmethane.** V. LAMPE AND M. GODLEWSKA. *Ber.* 51, 1355-60(1918); cf. preceding abstr.—Ethyl  $\alpha$ -*p*-carbometh-

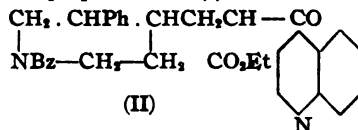
*oxycinnamylacetacetate* (a),  $\text{MeO}_2\text{COC}_6\text{H}_4\text{CH:CHCOCHAcCO}_2\text{Et}$ , from  $p\text{-MeO}_2\text{COC}_6\text{H}_4\text{CH:CHCOCl}$ ,  $\text{AcCH}_2\text{CO}_2\text{Et}$  and  $\text{NaOEt}$  in  $\text{Et}_2\text{O}$ , yellowish prisms from alc., m.  $94-6^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with greenish yellow color, gives a dark red color with  $\text{FeCl}_3$ ; there is also formed some *p*-*carbomethoxycinnamic anhydride*, white aggregates from  $\text{PhMe}$ , m.  $168-70^\circ$ . Hydrolysis and elimination of  $\text{CO}_2$  from (a) give *p*-*carbomethoxycinnamylacetone*, faintly yellow leaflets from alc., m.  $111-3^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with greenish yellow color, gives a red-brown color with alc.  $\text{FeCl}_3$ ; shaken in  $\text{Et}_2\text{O}$  with dil. alkali it gives *p*-*hydroxycinnamylacetone* (b), yellow leaflets from dil. alc., m.  $144-6^\circ$ , colored red by  $\text{H}_2\text{SO}_4$  and forming a dark red soln. With  $\text{NH}_2\text{OH.HCl}$  in boiling alc. (b) gives *3-carbomethoxystyryl-5-methyl- or 5-carbomethoxystyryl-3-methylisoxazole*, leaflets from alc., m.  $122-4^\circ$ . *p,p'*-*Dicarbomethoxydicinnamylmethane*, from (b),  $p\text{-MeO}_2\text{COC}_6\text{H}_4\text{CH:CHCOCl}$  and Na in anisole, canary-yellow aggregates from ligroin- $\text{C}_6\text{H}_6$ , m.  $162-6^\circ$ , colored red by  $\text{H}_2\text{SO}_4$  and forming a soln. with intense yellow fluorescence, gives a brown color with alc.  $\text{FeCl}_3$ . With  $\text{NH}_2\text{OH.HCl}$  in alc. it gives *3,5-di[carbomethoxystyryl]isoxazole*, white aggregates from alc., m.  $178-80^\circ$ , while shaking in  $\text{Et}_2\text{O}$  with 1% NaOH produces *p,p'*-*dihydroxydicinnamylmethane*, faintly orange needles from  $\text{C}_6\text{H}_6$ , m.  $218-20^\circ$  (decompn.), sol. in alc. with dark red color and greenish fluorescence, gives a dark brown color with  $\text{FeCl}_3$ , sol. in  $\text{H}_2\text{SO}_4$  with crimson color and faint yellow fluorescence; a boiling aq. suspension imparts to unmordanted cotton a canary-yellow color not fast to soap; paper impregnated with an alc. soln. gives with  $\text{H}_2\text{BO}_3$  a faint orange color turned black by alkalies and re-established by acids. *p*-*Carbomethoxydicinnamylmethane*, from  $\text{PhCH:CHCOCH}_2\text{Ac}$  and  $p\text{-MeO}_2\text{COC}_6\text{H}_4\text{CH:CHCOCl}$ , yellow needles from ligroin, m.  $114-6^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with orange-red color and golden yellow fluorescence, gives a dark brown color with alc.  $\text{FeCl}_3$ . *p*-*Hydroxydicinnamylmethane*, faintly orange prismatic needles from  $\text{C}_6\text{H}_6$ -ligroin, m.  $190-2^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with crimson color and golden yellow fluorescence, gives a dark brown color with  $\text{FeCl}_3$  and with  $\text{Cu}(\text{OAc})_2$  a brown color rapidly changing to greenish; it dyes unmordanted cotton faintly lemon-yellow; paper impregnated with it is almost unchanged by  $\text{H}_2\text{BO}_3$  and alkalies produce a dirty violet spot.

CHAS. A. ROUILLER.

**Cinchona alkaloids. XX. Building up of cinchonatoxines.** PAUL RABE AND KARL KINDLER. Chem. Staatslab., Hamburg. Ber. 51, 1360-5(1918); cf. C. A. 12, 2565.—*N-Benzoylhomocincholoipon ethyl ester* (I), from 0.1 mol. benzoyldihydrocinchotoxine Me sulfomethylate (Kaufmann, C. A. 11, 963) in 40 parts  $\text{H}_2\text{O}$  treated with 0.4 mol.  $\text{KMnO}_4$  in 1.5 l.  $\text{H}_2\text{O}$ , filtered, acidified with  $\text{HCl}$ , extd. with much  $\text{Et}_2\text{O}$ , the ext. concd. to  $1/3$  its vol., washed 3 times with  $\text{H}_2\text{O}$ , dried with  $\text{Na}_2\text{SO}_4$ , evapd. and esterified with 4% alc.  $\text{HCl}$ , is a reddish yellow oil with greenish fluorescence,  $b_D^{25} 256^\circ$ ; this is hydrolyzed more quickly and with better yield by dil.  $\text{HCl}$  than by  $\text{Ba}(\text{OH})_2$  (with subsequent esterification), as done by K., to the homocincholoipon ester, an oil with blue fluorescence,  $b_D^{14} 140^\circ$ . Equimol. proportions of (I) and Et cinchoninate



(I)



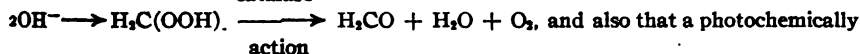
(II)

heated in  $\text{C}_6\text{H}_6$  with  $\text{NaOEt}$  15 hrs. gave 40% of the  $\beta$ -ketonic ester (II) as a thick reddish oil, which, boiled 3 hrs. with 16%  $\text{HCl}$ , exactly neutralized with  $\text{NaOH}$ , freed from  $\text{BzOH}$  and unchanged (II) by exhaustive extn. with  $\text{Et}_2\text{O}$ , then treated with excess of alkali and extd. with  $\text{Et}_2\text{O}$ , yielded dihydrocinchotoxine (dihydrocinchonicine) (a), identical with the product obtained by rearrangement of dihydrocinchonine under the influence of  $\text{AcOH}$ ; with 1 mol.  $\text{PhNHNH}_2$  and 2 mols. picric acid in alc. containing a little  $\text{AcOH}$  it gives the intensely red *dihydrocinchotoxine phenylhydrazones dipicrate*,

m.  $215^{\circ}$  (decompn.); it was also converted into the *C*-bromohydrocinchotoxine *dihydrobromide*, which with dil. soda and  $\text{Et}_2\text{O}$  yielded dihydrocinchoninone, m.  $138^{\circ}$ ,  $[\alpha]_D^{18} 74.41^{\circ}$  after 1 hr.,  $76.45^{\circ}$  after 8 days (*c* 2.446 in alc.). CHAS. A. ROUILLER.

Action of phosphorus pentachloride on formylphenylacetic ester. WILHELM WISLICENUS AND ERNST A. BILHUBER. Univ. Tübingen. *Ber.* 51, 1366-71 (1918).—Unlike formyl- or hydroxymethylenecamphor (*a*), which with  $\text{PCl}_5$  yielded directly a mono-Cl compd. in which Cl replaces an OH group (Bishop, Claissen and Sinclair, *Ann.* 281, 316 (1894)), a reaction from which B., C. and S. conclude that (*a*) contains a HO and not a true aldehyde group, formylphenylacetic esters first give a di-Cl compd.,  $\text{CHCl}_2\text{CHPhCO}_2\text{R}$ , which easily loses HCl, forming the unsatd. mono-Cl deriv., and probably the same thing happens in the case of (*a*). Thus, when 20 g. of the liquid  $\alpha$ -Et formylphenylacetate (*b*) is slowly treated with 22 g.  $\text{PCl}_5$ , first in ice and finally on the  $\text{H}_2\text{O}$  bath, freed from  $\text{POCl}_3$  at  $125^{\circ}$  and fractionated *in vacuo* there is obtained an oil (*c*) of sharp odor,  $b_{18} 121-5^{\circ}$ , with 31.7% Cl (calcd. for ethyl  $\beta, \beta$ -dichloro- $\alpha$ -phenylpropionate, 28.7%); when this is treated with steam, very little distills over and most of it dissolves in the hot liquid; on cooling  $\beta$ -chloro- $\alpha$ -phenylacrylic (chlorotropaic) acid (*d*) seps. in long, silky needles, m.  $119-20^{\circ}$  (yield, 1.1 g. from 5 g. (*b*)); ethyl ester,  $b_{11} 133^{\circ}$ . Ethyl  $\beta, \beta$ -dihydroxy- $\alpha$ -phenylpropionate, from the crude (*c*) and 2 mols. NaOEt in alc. on the  $\text{H}_2\text{O}$  bath, yellow oil,  $b_{20} 166-8^{\circ}$ ; it is obtained in better yield (68%) by boiling 6.4 g. (*b*) with 6 cc. alc., 5.1 g.  $\text{HC}(\text{OEt})_3$  and 0.1 g.  $\text{NH}_4\text{Cl}$  15 min.; warmed with a little dil. HCl and alc., it regenerates (*b*), while 1.33 g. boiled a long time in alc. with 0.12 g. Na and a few drops of  $\text{H}_2\text{O}$  gives 0.9 g. of the free acid, tablets from  $\text{C}_6\text{H}_6$ , does not decolorize  $\text{KMnO}_4$  or Br, softens  $132^{\circ}$ , m.  $139^{\circ}$  (loss of  $\text{CO}_2$ ); alc. is also lost, with formation of  $\text{PhCH:CHOEt}$ ,  $b_{700} 213-5^{\circ}$  (slight decompn.), immediately decolorizes  $\text{KMnO}_4$  in aq.  $\text{Me}_2\text{CO}$  and Br. Methyl  $\beta, \beta$ -dichloro- $\alpha$ -phenylpropionate, obtained in 6 g. yield from 9 g. of  $\alpha$ -Me formylphenylacetate and 11 g.  $\text{PCl}_5$ ,  $b_{28} 137-41^{\circ}$ , quickly becomes turbid and deposits crystals; this decompn. is complete after 0.5 hr. boiling with 5 parts  $\text{H}_2\text{O}$ , the product being (*d*). Methyl  $\beta, \beta$ -dimethoxy- $\alpha$ -phenylpropionate, m.  $46-7^{\circ}$ ,  $b_{13} 135-42^{\circ}$ . CHAS. A. ROUILLER.

Mechanism of the assimilation process. K. SCHAUM. Giessen. *Ber.* 51, 1372-5 (1918).—The possibility that peroxides play a role in the assimilation process (Willstätter and Stoll, *C. A.* 12, 1889) had already been pointed out by S. (*Sitzungsber. Ges. Beförd. ges. Naturwiss. Marburg* 1907, 158); at the time he suggested that the first stage in assimilation might be represented by the scheme  $\text{C}^{--}(\text{O}^+) + 2\text{H}^+ +$



influenced equil.,  $\text{C}(\text{OH})_4 \rightleftharpoons \text{H}_2\text{C}(\text{OOH})_2$ , might be assumed. The symbol  $\text{C}^{--}(\text{O}^+)$ , was based on the Helmholtz theory of light absorption according to which a specific light effect can occur only in the presence of polar elec. charges on the mols. On the basis of the electronic valence theory since established, chiefly by Stark, this view assumes a somewhat different form. A simple union between 2 atoms is brought about by the elec. fields of force between the positive spheres of the 2 atoms and 2 negative valence electrons, each genetically related to one of the atoms but also united to the

other; this may be represented by the scheme  $\text{A}_1 \begin{array}{c} \diagup \text{O} \diagdown \\ \diagdown \text{O} \diagup \end{array} \text{A}_2$ , where o represents the

electron, — its union with its own atom and ... its union with the other atom. In a double union, 4 valence electrons are brought close together and mutually repel each other to some extent, bulging out the fields of force and thus weakening the union and making possible combination with neighboring fields by intermol. rearrangement

or addition of foreign complexes. The simpler and more compact the field of force of an electron, the higher is its frequency and therefore the shorter the wave lengths at which its absorption spectrum lies. When the radiant energy absorbed by resonance so affects the field of an electron that it can combine with neighboring fields of its own or of a foreign mol., photochem. processes are possible. Whether the system  $\text{CO}_2\text{-H}_2\text{O}$  in its (ultraviolet) region of electronic resonance is capable of undergoing a photochem. conversion into a peroxide-like compd. and the chlorophyll complex merely shifts the spectral sensitiveness of the reaction must be decided by special expts. It seems more probable that the  $\text{H}_2\text{CO}_3$  complex by addition to the chlorophyll mol. has its fields of electronic valence so influenced that it can undergo the specific light reaction in question.

CHAS. A. ROUVILLER.

**Strychnos alkaloids. XXIV. Cause of the violet color reaction of cacotheline and related nitro compounds of the brucine series.** HERMANN LEUCHS. Univ. Berlin. *Ber.* 51, 1375-89(1918).— $\text{HNO}_3$  reacting on brucine produces the well known red brucine reaction, which depends on the change of the two  $\text{MeO}$  groups into a quinone (C. A. 5, 3430); further action of the  $\text{HNO}_3$  results in the introduction of a  $\text{NO}_2$  group and addition, in a way not detd., of  $\text{H}_2\text{O}$ , the final product being cacotheline (a),  $\text{C}_{21}\text{H}_{21}\text{O}_7\text{N}_3\cdot\text{HNO}_3$  (C. A. 6, 365), which, therefore, is apparently a nitrate of a hydrated and nitrated quinone unless the  $\text{H}_2\text{O}$ , on its addition, has destroyed the quinone grouping or the series of reactions is more complicated than would seem to be indicated by the formulas of the successive intermediate compds. The behavior of the red-yellow (a) towards  $\text{SO}_2$  in mineral acid solns., however, was up to the present not in harmony with a quinone structure, for instead of giving a colorless or lighter quinol it yields deep violet or dark green compds. with acids, apparently isomeric with the original yellow or red-yellow salts (C. A. 4, 2462). The compd.  $\text{C}_{21}\text{H}_{21}\text{O}_7\text{N}_3\cdot\text{MeNO}_3$  (b), obtained by the action of  $\text{HNO}_3$  on methylbrucine, likewise gives the violet color reaction with  $\text{SO}_2$ , and forms the subject of the present investigation. This time it was not prepd. from methylbrucine but by boiling 18 g. of the  $\text{Me}_2\text{SO}_4$  compd. of brucine for 1 hr. in 540 cc. of 10%  $\text{HNO}_3$ , letting stand in ice a long time, filtering and covering first with ice-cold 10%  $\text{HNO}_3$  and then with  $\text{Me}_2\text{CO}$ ; yield of air-dried product, 8 g. From cold soln. it seps. in orange tablets with 2  $\text{H}_2\text{O}$ , which are at first quite sol. in boiling  $\text{H}_2\text{O}$  (about 1:5) until difficultly sol. red anhydrous tables sep. In order to test for the presence of a quinone group, 0.54 g. in 25 cc. hot  $\text{H}_2\text{O}$  was treated with 0.42 g.  $\text{NH}_2\text{OH}\cdot\text{HCl}$  in 5 cc.  $\text{H}_2\text{O}$  and heated 0.5 hr. at  $100^\circ$ ; when acidified with 3 cc. of 5  $N$   $\text{HCl}$  and cooled in ice this gave *cacotheline chloromethylate mono-oxime*,  $\text{C}_{22}\text{H}_{23}\text{O}_7\text{N}_4\text{Cl}\cdot 2\text{H}_2\text{O}$ , yellow needles, gives a red color with  $\text{SnCl}_2$  in concd.  $\text{HCl}$  and with  $\text{Zn}$  and  $\text{HCl}$  a greenish color which then fades out; it gradually carbonizes without melting on heating and dissolves easily in alkalis and  $\text{NH}_4\text{OH}$  with yellow color. As only one  $\text{NOH}$  group enters in spite of the large excess of  $\text{NH}_2\text{OH}$  used, the product is possibly a nitrosophenol. A further test for the presence of the quinone grouping in (b) was sought by treating 3 g. of the (b). 2  $\text{H}_2\text{O}$  in 21 cc. of 12  $N$   $\text{HCl}$  with 2 g.  $\text{Sn}$  powder; the soln. became brown, then violet and finally colorless; after 1-2 hrs. it was dild. to 80 cc., whereupon 2.4 g. of a faintly greenish cryst. ppt. sepd. and concn. *in vacuo* yielded further crops of the same compound,  $\text{C}_{22}\text{H}_{23}\text{O}_8\text{N}_3\text{Cl}\cdot\text{HCl}\cdot\text{SnCl}_4\cdot 6\text{H}_2\text{O}$  (total yield, 4.4 g.), broad, rectangular prisms, becomes faintly greenish in the air; 2 g. in 100 cc.  $\text{H}_2\text{O}$  freed from  $\text{Sn}$  with  $\text{H}_2\text{S}$ , evapd. *in vacuo*, finally over  $\text{KOH}$ , and rubbed with 2 cc. of 5  $N$   $\text{HCl}$ , gives 0.9 g. of the *hydrochloride*,  $\text{C}_{22}\text{H}_{23}\text{O}_8\text{N}_3\text{Cl}\cdot\text{HCl}$ , 4- or 6-sided tables with 1 mol. solvent from  $\text{H}_2\text{O}$ , anhydrous needles from alc., sol. in  $\text{KOH}$  with pink color quickly changing to blue, especially on warming, and then yellow, with loss of  $\text{NH}_3$ , sol. in  $\text{NH}_4\text{OH}$  with yellow color changing to brown and then to yellow again, becomes brown and carbonizes from  $260^\circ$  up, gives no color with  $\text{Na}_2\text{SO}_3$  or  $\text{SO}_2$ . The 4 H atoms

used up in the reduction of (b) apparently served, besides the formation of the  $\text{NH}_2$  group, to reduce the quinone to the quinol grouping. On the other hand  $\text{SO}_2$  not only leaves the  $\text{NO}_2$  group unchanged but the 2 atoms of H which would serve for the reduction of the quinone are not taken up; when 3 g. (b) is warmed with 1 mol.  $\text{Na}_2\text{SO}_3$  in 45 cc.  $\text{H}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath for a short time, the soln. turns violet and soon deposits crystals; after 1 hr. in ice there is obtained 1.3 g. dark violet, almost black prisms (c) with metallic luster, of the compn.  $\text{C}_{21}\text{H}_{21}\text{O}_7\text{N}_3 \cdot \text{MeSO}_3\text{H}$  with 5.36% (more than 2 mols.)  $\text{H}_2\text{O}$  (with 2 mols.  $\text{NaHSO}_3$  the yield from 3 g. (b) is 2.9 g.). In the cold the reaction is much slower (1.9, 2.5 and 2.7 g. after 1, 2 and 4 days, resp.); sometimes the reaction follows a different course; the product seps. in colorless, silky leaflets with 6  $\text{H}_2\text{O}$  which also change into the violet (c), but about 1 week, with frequent shaking, is required for this change to be complete; with strong acids the salt evolves  $\text{SO}_2$  and on long standing in the dry state or warming with  $\text{H}_2\text{O}$  it goes over into (c). In (c) the  $\text{SO}_3\text{H}$  is attached with extraordinary firmness for the (c) dissolves in cold concd.  $\text{H}_2\text{SO}_4$  and is reprecipitated unchanged by  $\text{H}_2\text{O}$ . When 1 g. (c) is boiled 2 min. with 20 cc. of 2.5 N  $\text{HNO}_3$  and cooled in ice or 3 g. is kept 10 min. with 30 cc. of 5 N  $\text{HNO}_3$  at  $20^\circ$  and then diluted with 90 cc.  $\text{H}_2\text{O}$  there is obtained 70% of a compound,  $\text{C}_{22}\text{H}_{22}\text{O}_7\text{N}_3\text{SO}_3\text{H}$ , (d), red-yellow domatic prisms or 3-sided and trapezoid leaflets with 2  $\text{H}_2\text{O}$ , brick-red when anhydrous, which seems to take up H very readily, e. g., in contact with a Ni spatula when moist, but especially in acid solns., giving green-brown crystals, perhaps of a quinhydrone nature, and finally violet crystals; this also seems to occur, by autoreduction on recrystn., the red-yellow color of the crude product changing to brown-yellow or greenish brown; with Ni in HCl,  $\text{SO}_2$  on the  $\text{H}_2\text{O}$  bath or  $\text{NH}_4\text{OH}$  in acid soln. it regenerates (c) while in alk. soln. with  $\text{NH}_4\text{OH}$  and subsequent acidification it gives  $\text{SO}_2$  and cacotheline methochloride oxime. With Sn in concd. HCl it yields, after removal of the Sn with  $\text{H}_2\text{S}$  and evapn. *in vacuo*, an amorphous residue which, on rubbing with a little  $\text{H}_2\text{O}$ , at first forms small tables, presumably of the aminoquinol hydrochloride  $\text{C}_{22}\text{H}_{22}\text{O}_8\text{N}_3\text{SO}_3\text{H} \cdot \text{HCl}$ , which, however, redissolve on further diln. and are replaced by a sandy ppt. of a non-basic anhydride,  $\text{C}_{22}\text{H}_{22}\text{O}_7\text{N}_3\text{S}$ , needles sol. in about 4000 parts  $\text{H}_2\text{O}$  at  $100^\circ$ , does not change up to  $290^\circ$ , sol. in  $\text{NH}_4\text{OH}$  with a pink color changing to yellow, in NaOH with pink color changing to blue, at once reduces  $\text{AgNO}_3$ , sol. in dil. HCl but depositing the HCl salt at a certain concn., gives no color with  $\text{SO}_2$ , unchanged by  $\text{NH}_4\text{OH} \cdot \text{HCl}$  but loses  $\text{SO}_2$  when heated with  $\text{NH}_4\text{OH}$  in alk. soln. The green-brown and the violet compds. can be reduced in the same way. In  $\text{NH}_4\text{OH}$  soln. protected from the air (c) is quite stable but in the presence of air the violet soln. soon becomes red-yellow and is found to contain about 10% (d), but about 60% is changed into a compound,  $\text{C}_{21}\text{H}_{22}\text{O}_{11}\text{N}_3\text{S}$  (e), red-yellow domatic prisms and polyhedrons with 2  $\text{H}_2\text{O}$ , turns brown  $230^\circ$ , carbonizes  $280-90^\circ$ , easily sol. in  $\text{NH}_4\text{OH}$  and alkalis with pure yellow color, neutralizing 2 mols., splits off  $\text{SO}_2$  with warm N alkalis, gives only a very faint violet color with  $\text{SO}_2$  or  $\text{SnCl}_2$  (probably due to impurities); with Zn and HCl, it becomes brown, then faintly violet and finally colorless with evolution of  $\text{H}_2\text{S}$ . The structure of (b) and similar salts is, as far as detd., to be represented by  $\text{C}_{17}\text{H}_{19}\text{O} \{ -\text{CO} \cdot \text{N} < -\text{NO}_2; \text{NMeX} - \text{CO} \cdot \text{CO} - \text{CH} \cdot \text{CH} \cdot (\text{OH}) \}$  (X =  $\text{NO}_2$ ,  $\text{SO}_3\text{H}$ , etc.). That (c) is a quinol is shown by its oxidation to (d) and its regeneration with  $\text{SO}_2$ . Since there is a quinone group in (b), H must add to this grouping in the formation of (c) but this H is not furnished by the  $\text{SO}_2$ , since it enters the mol. unchanged and the H content of (b) and (c) are alike. The H must therefore be supplied intramol. under the influence of the  $\text{SO}_3\text{H}$ , and it is probably the sec. alc. grouping which supplies this H:  $-\text{CO} \cdot \text{CO} - + -\text{CH}(\text{OH}) - \rightarrow -\text{C}(\text{OH}) : - \text{C}(\text{OH}) - + > \text{CO}$ . The resulting  $> \text{CO}$  group might then combine, like bisulfite compds., with the  $\text{SO}_3\text{H}$  residue already attached to the N;  $\rightarrow \text{NMeSO}_3\text{H} + > \text{CO} \rightarrow$

→ $\text{NMeSO}_2\text{O.C(OH)}<$ . Quadrivalent basic O and salt-like union of the acid residue with it is also a possibility; this might explain the strikingly intense color. But the masking of the  $\text{H}_2\text{SO}_4$  is not sufficient to produce the violet color: the quinol grouping must also be present, for the quinone (*d*), although containing masked  $\text{H}_2\text{SO}_4$ , is only red-yellow. The  $\text{NO}_2$  group also plays a part; the amino, quinol and its anhydride are colorless and do not react with  $\text{SO}_2$ .

CHAS. A. ROUVIER.

**Reducibility of formic acid.** K. A. HOFMANN AND HELGE SCHIBSTED. Techn. Hochschule, Berlin. *Ber.* 51, 1389-98(1918).—Attempts to reduce  $\text{HCO}_2\text{H}$  to  $\text{HCHO}$  and  $\text{MeOH}$  with  $\text{H}$  under the most varied conditions never resulted in a greater yield than 4%. The  $\text{HCHO}$ -morphine  $\text{H}_2\text{SO}_4$  reaction was used only for identification and approx. detn. of the  $\text{HCHO}$ , quant. estimations of the  $\text{HCO}_2\text{H}$ ,  $\text{HCHO}$  and  $\text{MeOH}$  being made by exact titration. (1) In one portion of the product the free  $\text{HCO}_2\text{H}$  was titrated with 0.1 *N* alkali and litmus. (2) To another portion was added approx. twice the calcd. amt. of 0.1 *N*  $\text{I}$ , then 10%  $\text{KOH}$  to strong alkalinity, and the soln. acidified after 10 min. with dil.  $\text{HCl}$  and the excess of  $\text{I}$  titrated with  $\text{Na}_2\text{S}_2\text{O}_3$ . If the soln. originally does not contain more than 5%  $\text{HCO}_2\text{H}$  the reaction proceeds according to the equation  $\text{HCHO} + \text{I}_2 + 3\text{KOH} = \text{HCO}_2\text{K} + 2\text{KI} + 2\text{H}_2\text{O}$ ; higher concns. of formate have an increasing reducing action on the  $\text{I}$ . (3) The  $\text{HCO}_2\text{H}$ ,  $\text{HCHO}$ ,  $\text{Me}_2\text{CO}$  and  $\text{MeOH}$  are oxidized to carbonate when a third portion of the product is heated 0.5 hr. on the  $\text{H}_2\text{O}$  bath with 5 times the calcd. amt. of 0.5 *N*  $\text{KMnO}_4$  and 10 cc. of 10%  $\text{KOH}$ ; the soln. is then acidified with dil.  $\text{H}_2\text{SO}_4$ , the  $\text{MnO}_2$  and  $\text{KMnO}_4$  are reduced with 0.5 *N*  $(\text{CO}_2\text{H})_2$  and the excess of the  $(\text{CO}_2\text{H})_2$  is titrated with 0.5 *N*  $\text{KMnO}_4$ . **Reduction in  $\text{H}_2\text{O}$  with nascent  $\text{H}$  under atm. pressure:** 65 g. granulated  $\text{Zn}$  were treated 12 hrs. with the catalyst and a little  $\text{H}_2\text{O}$ , then allowed to stand 2 days with 49 g.  $\text{HCO}_2\text{H}$  and 100 cc.  $\text{H}_2\text{O}$  and completely distd. at  $100-20^\circ$ ; below are the amts. in g. of the  $\text{HCHO}$ ,  $\text{MeOH}$  and total reduced  $\text{HCO}_2\text{H}$ , resp., obtained with different catalysts;  $\text{Hg}$  (corresponding to 2 g.  $\text{HgSO}_4$ ), 0.0033, 0, 0.0099;  $\text{Cd}$  (2 g.  $\text{CdSO}_4 + \frac{1}{2} \text{H}_2\text{O}$ ), 0.009, 0.234, 1.009;  $\text{Cu}$  (2 g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ), 0.0213, 0.2865, 1.301;  $\text{V}_2\text{O}_5$  (0.5 g.  $\text{NaVO}_3$ ), 0.0284, 0.3251, 1.487;  $\text{V}_2\text{O}_5$  with 10 g.  $\text{HCO}_2\text{Na}$ , 0.043, 0.3535, 1.655. Addition of dil.  $\text{H}_2\text{SO}_4$  facilitated the evolution of the  $\text{H}$  without materially increasing the yields, although in the case of  $\text{Cd}$  0.03 g.  $\text{HCHO}$  was obtained and with  $\text{Hg}$  0.39 g.  $\text{MeOH}$ . In neutral soln. with 0.1 g.  $\text{PdCl}_2$ , 40 g.  $\text{HCO}_2\text{Na}$  and 100 cc.  $\text{H}_2\text{O}$  the yields were 0.002, 0.23, 0.991 g. With  $\text{Zn}$  dust with and without  $\text{Pd}$  2.9 and 2.2% yields of  $\text{MeOH}$ , without  $\text{HCHO}$ , were obtained from  $\text{HCO}_2\text{Na}$ . From 60 cc. of 15%  $\text{HCO}_2\text{H}$  dist. on the  $\text{H}_2\text{O}$  bath were obtained: with 2 cc. of 1%  $\text{H}_2\text{PtCl}_6$  0.0095 g.  $\text{HCHO}$ , 0.0151 g.  $\text{MeOH}$  ( $\text{Zn}$  used 4.84 g.); the same + 5 g.  $\text{HCO}_2\text{Na}$ , 0.0104 and 0.0178 g. ( $\text{Zn}$  used 4 g.).  $\text{Pd}$  and  $\text{Ir}$  are about equal to  $\text{Pt}$ .  $\text{Rh}$  is somewhat more effective. **Reduction under pressure:** 5.6 g.  $\text{Zn}$ , 60 cc. of 15%  $\text{HCO}_2\text{H}$  and the catalyst in sealed tubes of about 150 cc. capacity filled with  $\text{CO}_2$  were heated 72 hrs. at  $70^\circ$ ; the pressure developed, calcd. on the basis of the max. possible amt. of  $\text{H}$  evolved, was about 20 atm. Below are the amts. of  $\text{HCHO}$  and  $\text{MeOH}$  formed and of  $\text{Zn}$  used, resp., with different catalysts:  $\text{Pt}$  (2 cc. of 1%  $\text{H}_2\text{PtCl}_6$ ), 0.003, 0.010, 4.56;  $\text{Pt} + 5$  g.  $\text{HCO}_2\text{Na}$ , 0.0057, 0.0106, 2.53;  $\text{Pd}$  (2 cc. of 1%  $\text{PdCl}_2$ ), 0.0045, 0.0052, 4.21; no catalyst, 0.0006, 0.004, 0.55.  $\text{Rh}$  and  $\text{FeSO}_4$  gave perceptibly more  $\text{HCHO}$ ;  $\text{Ir}$ ,  $\text{Ru}$  and  $\text{NaVO}_3$  were not more effective. The above results, however, represent only the difference between the amts. of  $\text{HCHO}$  and  $\text{MeOH}$  formed by reduction of the  $\text{HCO}_2\text{H}$  and those destroyed by further reduction; thus, if 9 cc. of 35%  $\text{HCHO}$  is heated as above with 2 cc. of 1%  $\text{PdCl}_2$ , 44% of the  $\text{HCHO}$  disappears with partial formation of  $\text{MeOH}$ . **Reduction with simultaneous catalytic decomposition of the  $\text{HCO}_2\text{H}$ :** Marquard clay tubes impregnated with solns. of salts of the  $\text{Pt}$  metals and then ignited powerfully catalyze the reaction  $\text{HCO}_2\text{H} = \text{CO}_2 + \text{H}_2$ , but even under these conditions the nascent  $\text{H}$  has but small power to reduce  $\text{HCO}_2\text{H}$ ;



40 g.  $\text{HCO}_2\text{Na}$  distd. over palladinized tubes gave only traces of  $\text{HCHO}$  and 0.05 g.  $\text{MeOH}$ . Free  $\text{HCO}_2\text{H}$  in dil. soln. is not decompd. by the salts of the Pt metals even after 44 hrs. at  $70-80^\circ$  in closed tubes. Addition of 5 g.  $\text{HCO}_2\text{Na}$  to 60 cc. of 15%  $\text{HCO}_2\text{H}$  increases the catalytic decompn. on distg. over Rh or Pd tubes 30-40% without yielding more than traces of  $\text{HCHO}$ . Concd. (85%)  $\text{HCO}_2\text{H}$  with 20%  $\text{HCO}_2\text{Na}$  is catalyzed extensively by Ir, Pt or Pd tubes on distn. but again with formation of only traces of  $\text{HCHO}$ . The vapors of  $\text{HCO}_2\text{H}$  passed over the catalyst are decompd. into  $\text{CO}_2 + \text{H}_2$  by Pd sponge at  $110^\circ$ , Pt sponge at  $120^\circ$ , Cu powder at  $190^\circ$ , reduced Ni and Cd at  $280^\circ$ , and into  $\text{CO} + \text{H}_2\text{O}$  by  $\text{TiO}_2$  and  $\text{WO}_3$  above  $170^\circ$ , while  $\text{SiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$  and  $\text{UO}_2$  also slightly catalyze the reaction  $2\text{HCO}_2\text{H} = \text{HCHO} + \text{CO}_2 + \text{H}_2\text{O}$ . These results are not markedly changed when the  $\text{HCO}_2\text{H}$  is passed with steam over the catalyst; in the most favorable cases barely detectable amts. of  $\text{HCHO}$  are formed at temps. not much beyond  $150^\circ$ . Asbestos favors the decompn. into  $\text{CO} + \text{H}_2\text{O}$  at low temps., the ratio  $\text{CO}:\text{H}_2$  remaining quite const. at 0.04 from  $196-296^\circ$  with pure asbestos and at 0.24 with Ni asbestos. Sugar charcoal at  $275-90^\circ$  gave 0.005 g.  $\text{HCHO}$  and 0.004 g.  $\text{MeOH}$  with 4.8 g.  $\text{HCO}_2\text{H}$  without any noticeable difference when the acid vapors were passed over the catalyst mixed with  $\text{CO}_2$  or with  $\text{H}_2$ ; with blood charcoal at  $260-70^\circ$  were obtained 0.005 g.  $\text{HCHO}$  and 0.041 g.  $\text{MeOH}$  from 4 g.  $\text{HCO}_2\text{H}$ .

CHAS. A. ROUILLER.

**Preparation of formaldehyde and methyl alcohol from formates.** K. A. HOFMANN and HELGE SCHIBSTED. Techn. Hochschule, Berlin. *Ber.* 51, 1398-418(1918); cf. preceding abstr.— $\text{HCHO}$  and  $\text{MeOH}$  can be obtained from formates with such good yields that this may become a com. method of prepn. of these substances from  $\text{CO}_2$  or  $\text{CO}$ . In no case does the reduction of  $\text{HCO}_2\text{H}$  by added  $\text{H}$  or its reaction with  $\text{CO}$  or that of  $\text{CO}$  with  $\text{H}$  have any influence on the yields; it is never truly a case of reaction in the gas phase but an intramol. rearrangement of the formate mols., which, to be sure, is greatly influenced by the manner of heating, the  $\text{H}_2\text{O}$  content and other admixtures. Also when  $\text{HCO}_2\text{H}$  vapors are passed over catalysts it is only the part combined as formate in an intermediate stage which plays a decisive role in the yields. These formates,  $(\text{HCO}_2)_2\text{M}'$ , probably yield primarily only  $\text{M}'\text{CO}_2 + \text{HCHO}$  and the latter then, depending on the nature of the contact substance, undergoes various changes, the most important of which is the rearrangement into  $\text{MeOH}$  and  $\text{HCO}_2\text{H}$ . That this takes place directly from  $\text{HCO}_2\text{H}$  is doubtful for not only the formates of strong bases (Ca, Ba, Sr, Li) give  $\text{MeOH}$  but so do also those of weak bases (Zn, Th) and, indeed, the better yields; the  $\text{HCHO}$  is probably formed chiefly from  $\text{HCO}_2\text{Me}$ . The following were found to be the temps. at which the evolution of gas from the various formates was marked and continuous: Cu  $170^\circ$ , Pb  $195-200^\circ$ , Ni  $210^\circ$ , Zn  $240-5^\circ$ , Fe'  $245-50^\circ$ , Mn  $295-300^\circ$ ,  $\text{UO}_2$   $317^\circ$ , Ba  $325^\circ$ , Ca  $335^\circ$ , Mg  $340-5^\circ$ , Sr  $355^\circ$ , Li  $355^\circ$ , Na  $355^\circ$ , K  $375^\circ$ . *Decompn. of  $(\text{HCO}_2)_2\text{Zn}$ :* The formates were heated in currents of various gases in metal baths or electrically heated tubes. With the exception of steam, the nature of the gas ( $\text{CO}_2$ ,  $\text{CO}$ ,  $\text{H}_2$ ,  $\text{N}_2$ , air) has no influence on the yield of  $\text{HCHO}$ ,  $\text{MeOH}$  and total reducing products.  $\text{H}_2\text{O}$  vapor in the small concn. in which it occurs in gases washed at room temp. has a slight unfavorable influence when the salt is finely powdered and heated very rapidly; if the salt is coarsely cryst. it distinctly increases the  $\text{HCHO}$  yield when the decompn. temp. is reached rapidly. Large amts. of  $\text{H}_2\text{O}$  vapor (such as are obtained by passing the gases through  $\text{H}_2\text{O}$  at  $80^\circ$ ) are very harmful, 90% of the reaction proceeding with evolution of  $\text{H}_2$ , according to the equation  $\text{HCO}_2\text{H} = \text{CO}_2 + \text{H}_2$  or  $(\text{HCO}_2)_2\text{Zn} + \text{H}_2\text{O} = \text{ZnO} + 2\text{CO}_2 + 2\text{H}_2$ . The state of subdivision of the salt has a great influence, the coarse crystals giving considerably less  $\text{HCHO}$  and total reducing products than the finely divided form distributed on asbestos. This is due to the sensitiveness of the  $\text{HCHO}$  first formed to contact in-

fluences; when the salt is finely divided, the HCHO escapes more quickly into the gas space. Similarly, the rapidity with which the current of gas is passed through the heated mixt. has a great influence; in a rapid current of air the HCHO escapes practically all unchanged while in a slow current it is changed largely into MeOH. If the salt is finely divided, the rapidity with which it is heated from without to the decompn. temp. has no influence on the HCHO and total yields, but if it is present in coarse crystals the HCHO diminishes with rapid heating. Under the most favorable conditions the yield of HCHO is about 25% and that of total reducing substances 40%.  $\text{HCO}_2\text{Me}$ , b.  $32.5^\circ$ , d. 0.9742, was obtained in 3.21 g. yield from 100 g. of the Zn salt at  $260-80^\circ$ . Small amts of empyreumatic substances are also formed. Addition of 20% Zn vanadate, molybdate and tungstate diminish greatly the HCHO and somewhat the total yields; infusorial earth, quartz sand and sugar charcoal are indifferent;  $\text{Al}_2\text{O}_3$  and  $(\text{HCO}_2)_2\text{Al}$  diminish the yields of HCHO and MeOH almost to zero; finely divided Ni and  $(\text{HCO}_2)_2\text{Ni}$  decomp. the products almost completely into CO and H, with 4%  $\text{CH}_4$ . Cu and  $(\text{HCO}_2)_2\text{Cu}$  reduce the HCHO to 1% and less;  $\text{HCO}_2\text{Li}$  and other easily fusible substances likewise reduce the HCHO because, owing to the sintering of the mass, it cannot escape quickly. The decompn. of  $(\text{HCO}_2)_2\text{Zn}$  at  $240^\circ$  is about 60% into  $\text{HCHO} + \text{ZnCO}_3$  and, when  $\text{H}_2\text{O}$  is excluded, 40% into  $\text{CO} + \text{H}_2 + \text{ZnO} + \text{CO}_2$ ; if a little  $\text{H}_2\text{O}$  vapor is present, the amt. of CO diminishes and that of H increases.

*Decompn. of other formates:* The Li salt, owing to the high temp. at which it decomp. ( $350^\circ$ ), and on account of the strongly basic nature of its oxide, gives only little HCHO and instead yields  $\text{Me}_2\text{CO}$ , MeOH, furfural, pyruvic acid, empyreuma and charcoal. The more slowly it is heated the more the gaseous products increase at the expense of the  $\text{Me}_2\text{CO}$  and MeOH; a little  $\text{H}_2\text{O}$  vapor increases the total reducing substances while much steam is injurious; H seems to be better than  $\text{CO}_2$ . When  $\text{H}_2\text{O}$  is present, the ratio  $\text{CO}:\text{H}_2$  in the evolved gases is 9-10, the reaction  $2\text{HCO}_2\text{Li} + \text{CO}_2 = \text{Li}_2\text{CO}_3 + 2\text{CO} + \text{H}_2\text{O}$  proceeding 4-5 times more rapidly than the reaction  $2\text{HCO}_2\text{Li} = \text{Li}_2\text{CO}_3 + \text{CO} + \text{H}_2$ . The Pb salt, decomp. at around  $200^\circ$ , gives HCHO and very much MeOH with relatively little H and CO; H has a beneficial effect in that it reduces the PbO formed which otherwise oxidizes some of the HCHO and MeOH;  $\text{H}_2\text{O}$  vapor in moderate concn. also has a favorable influence; CO is indifferent; rapid heating gives better results than slow heating; in the gaseous products the ratio  $\text{CO}:\text{H}_2$  is very small (0.15). The Tl salt (10 g.) in moist  $\text{CO}_2$  gives 2 mg. HCHO, 90 mg. MeOH, etc.,  $\text{CO}:\text{H}_2$  0.05-0.11; for the Cd salt the values are 4, 40. 0.05; the Co salt yields only traces of MeOH, etc.,  $\text{CO}:\text{H}_2$  0.36; the Cr salt gives 2 mg. HCHO, 14 mg. MeOH, etc.,  $\text{CO}:\text{H}_2$  0.85; the Al salt gives no HCHO or MeOH; the Sn salt gives a good yield of HCHO, almost no MeOH,  $\text{CO}:\text{H}_2$  0.35; the salts of the Y earths give very perceptible amts. of HCHO, some  $\text{Me}_2\text{CO}$ , much MeOH, some charcoal (total reducing substances 27%); the Mg salt forms little HCHO, some  $\text{Me}_2\text{CO}$ , relatively much MeOH, some empyreuma and charcoal (total volatile reducing products 25%); the Ca salt behaves like the Mg salt (total volatile products 17%); the Mn salt gives little HCHO, some  $\text{Me}_2\text{CO}$ , relatively much empyreuma and charcoal (total volatile products 30%).

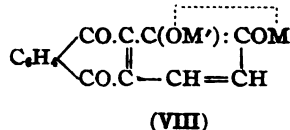
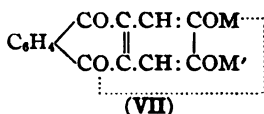
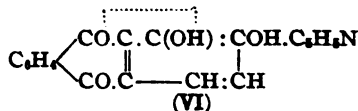
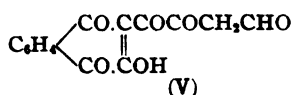
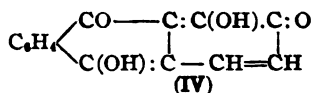
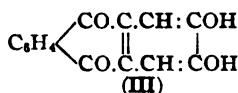
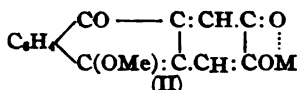
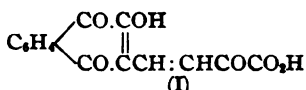
*Conversion of  $\text{HCO}_2\text{H}$  into HCHO and MeOH in contact with a substance which changes chemically:* The conversion can be satisfactorily effected by so choosing the contact substance and the temp. that formates are formed which then decomp. into HCHO and MeOH. As contact substances the best are the oxides (obtained by decompn. of the formates at low temps.) of Zn and of the rare earths of the Y and didymium groups, especially  $\text{ThO}_2$ ; less efficient are CaO, MgO, MnO and FeO. The  $\text{HCO}_2\text{H}$  is either dropped upon the oxide loosely spread out in a distg. flask or it is heated to  $80^\circ$  and its vapors are carried by means of dry H,  $\text{CO}_2$  or N over the oxide, mixed with asbestos, in a short, glass tube. The process differs from that based on the decompn. of preformed formates in that the HCHO

formed passes over a comparatively large surface of heated oxide and therefore undergoes a more extensive conversion into  $\text{HCO}_2\text{Me}$ ,  $\text{MeOH}$ , aldol-like compds., then  $\text{Me}_2\text{CO}$ , empyreuma, furfural, etc. The addition of Cu powder, sugar charcoal, tungstates, etc., has the same deleterious effects as in the decompn. of formates. Zn dust for a time increases the yield by reducing the formates to some extent but as it is thereby oxidized to ZnO its beneficial effect soon ceases. As the  $\text{HCO}_2\text{H}$  is decompd. to a considerable extent at the reaction temp. before it reaches the contact substance the yield of reducing products is markedly less than in the decompn. of pre-formed formates; the  $\text{H}_2\text{O}$  from the decompd. acid also exerts a harmful influence. In order to obtain, with the best contact substances ( $\text{ZnO}$  and  $\text{ThO}_2$ ), practically the same yields of  $\text{HCHO}$ ,  $\text{MeOH}$ , etc., as from pre-formed formates the oxide is satd. at about  $200^\circ$  with  $\text{HCO}_2\text{H}$  vapors (as dry as possible) carried over with  $\text{CO}_2$ , then the temp. is raised to  $250\text{--}70^\circ$  until the formates are to a great extent decompd., the oxide is cooled to  $200^\circ$ , again satd., etc. In the case of  $\text{Li}_2\text{CO}_3$ -asbestos it would seem that a basic glyoxylate, rather than  $\text{HCHO}$ , is the primary product.

CHAS. A. ROUILLER.

Action of potassium ferricyanide on alizarin in alkaline solution and the constitution of the hydroxyanthraquinones in their salts. ROLAND SCHOLL AND A. ZINKE. Univ. Graz and Techn. Hochschule, Dresden. *Ber.* 51, 1419-35(1918).—When an alk. soln. of alizarin (*a*) is treated with  $\text{K}_3\text{Fe}(\text{CN})_6$ , the acid (I) is formed, the structure of which permits of drawing certain conclusions as to the constitution of (*a*) in alk. soln. Perkin, v. Georgievics and Dimroth believe that hydroxyanthraquinones in the form of their salts have the quinoid structure but up to the present there is no expl. basis for such a formulation. One fact, however, has long been known which with our present views the ordinary benzenoid conception of the salts of hydroxyanthraquinones does not satisfy, *vis.*, the mordant-dye nature of these compds. first observed in the case of hystazarin (*b*) by Noelting. According to Werner's theory of mordant dyes that in the majority of cases such dyes form metallic inner complex salts this property in (*b*) seems reconcilable only with the quinoid structure (II). But while (*b*) lakes with metallic mordants like 1-hydroxyanthraquinone, (*a*) 2-Me ether and other compds. with a HO in the *o*-position to the C:O group, it does not, like the latter, form an inner complex with anhydrous  $\text{SnCl}_4$  (Pfeiffer) and in the free form would therefore seem to be a true pyrocatechol deriv. (III). Adopting these views, the formation of (I) from (*a*) would indicate that (*a*) in alk. soln. has the *p*-quinoid structure (IV), for if it had the *o*-quinoid form, as believed by v. Georgievics, it should yield (V) instead of (I). This quinoid structure of hydroxyanthraquinone salts applies only to those formed like the lakes of (*b*), *i. e.*, by the action of metallic hydroxides (and  $\text{NH}_4\text{OH}$ ), and not to Pfeiffer's  $\text{C}_6\text{H}_5\text{N}$  salts, inner complex  $\text{SnCl}_4$  compds. and Sn lakes formed from the latter by the action of  $\text{H}_2\text{O}$ , which from their method of formation and properties very probably have the benzenoid structure (VI) assigned to them by P. It would therefore follow that hydroxyanthraquinones can form tautomeric benzenoid and quinoid salts, but although this affords a good explanation of many phenomena in this field the assumption of quinoid formation to account for the mordant properties of (*b*) and in general for the behavior of hydroxyanthraquinones towards metallic hydroxides is superfluous. Just as in Pfeiffer's derivs. of  $\alpha$ -hydroxyanthraquinone derivs. an inner complex is formed between the H (or metal) of the HO (or MO) and the C:O group in the *o*-position to it, so in lakes of (*b*) it may be assumed that there is an inner complex formation between the MO and the *p*-C:O groups (VII); in 2-hydroxyanthraquinone, indeed, which possesses mordant properties, though not to so marked an extent as the 1-HO isomer, the formation of such an inner complex ring is the only possibility. Moreover (*b*) and all other di- and polyhydroxyanthraquinones with HO groups in the *o*- or *p*-position to each other also have the power of forming inner complex salts or

anions between the two HO groups (VIII), for Weinland and Binder's triazalariniferic acid corresponds in structure with their tripyrocatecholferric and -aluminic acids, and quinizarin forms a similar ferric acid. Twenty g. (a) in 1800 g. H<sub>2</sub>O and 72 g.



KOH cooled in running H<sub>2</sub>O was treated with 160 g. K<sub>3</sub>Fe(CN)<sub>6</sub> in 350 g. H<sub>2</sub>O in the course of 5 min., allowed to stand 15 min., neutralized with concd. HCl, filtered, washed with H<sub>2</sub>O, treated while still moist with aq. NaOAc (whereupon the product dissolved almost completely), filtered at once, again pptd. with concd. HCl, washed thoroughly with H<sub>2</sub>O and dried *in vacuo* over H<sub>2</sub>SO<sub>4</sub>, giving 14-15 g. crude *2-hydroxy-1,4-naphthoquinono-3-vinylglyoxylic acid* (I) as a brown-yellow powder, stable indefinitely at room temp. but begins to decomp. 70-80°, sol. in hot H<sub>2</sub>O but partially decomps. in a few min. on boiling, losing CO<sub>2</sub> and depositing a substance, C<sub>12</sub>H<sub>6</sub>O<sub>4</sub>(?), sol. in NaOH. The crude (I) in dil. NaOAc treated with CaCl<sub>2</sub> gives a violet-brown *calcium salt*, C<sub>14</sub>H<sub>6</sub>O<sub>6</sub>.Ca.7H<sub>2</sub>O, slender rodlets from 300 parts boiling H<sub>2</sub>O, losing 4 mols. H<sub>2</sub>O in boiling H<sub>2</sub>O and sepg. from concd. soln. as the difficultly sol. black-violet *trihydrate*, slender spindle-shaped crystals, best obtained by covering the heptahydrate with H<sub>2</sub>O and heating 1 hr. on the H<sub>2</sub>O bath under an air condenser; it is also obtained in dark brown, opaque pseudomorphs after the rodlet form at room temp. *in vacuo* over CaCl<sub>2</sub> or H<sub>2</sub>SO<sub>4</sub>; when recrystd. from very dil. soln. containing a little CaCl<sub>2</sub> it seps. as the heptahydrate. The above hydrates at 110-20° yield a black-violet *monohydrate*. The very pure heptahydrate boiled some time in concd. soln. deposits, together with the trihydrate, a *dihydrate* in slender, brown-yellow, rhombic leaflets with bronze luster, much more slowly sol. in boiling H<sub>2</sub>O than the mono- and trihydrates and yielding the heptahydrate from dil. soln. The acids liberated from all 4 hydrates yield the heptahydrate with CaCl<sub>2</sub> in NaOAc. S. and Z. believe the hepta- and dihydrates contain a hydrated, the tri- and monohydrates a pure ketone group and that the not quite pure heptahydrate contains an impurity which catalytically accelerates the dehydration of the hydrated ketone and makes it impossible to obtain the dihydrate with boiling H<sub>2</sub>O. The dark salts are also possibly inner complexes. The free (I), obtained pure by hydrolysis of the esters, with alc. KOH, soln. of the resulting K salt in H<sub>2</sub>O, pptn. with HCl and extn. with Et<sub>2</sub>O, forms honey-yellow hydrated leaflets weathering in the air but completely losing the H<sub>2</sub>O (probably chemically combined with the ketone group) only after several days *in vacuo* over H<sub>2</sub>SO<sub>4</sub>. It turns brown above 150°, black above 200° and m. about 230° (decompn.), sol. in cold H<sub>2</sub>O with yellow, in hot H<sub>2</sub>O with yellowish red color changing to yellow again on addition of a little HCl;

the red-yellow concd. alc. solns. are turned red by  $H_2O$ , yellow by a little dil.  $HCl$ ; it dissolves in  $H_2SO_4$  with yellow color and gives a dark red color with alc.  $FeCl_3$ . The salts, excepting those with the alkalis, are difficultly sol. in cold  $H_2O$ ; those of the alk. earths,  $Mg$ ,  $Mn$  and  $Cd$  are cryst. (I) dissolves in alkalis,  $NH_4OH$ ,  $Na_2CO_3$  and  $NaOAc$  with yellowish red color.  $Na_2S_2O_4$  gives with a cold alk. soln. a soln. sensitive to air which is green in thin, violet in thick layers, and becomes light yellow on warming and then red, owing to oxidation. The cold  $NaOH$  soln. is turned emerald-green, then yellow-green by  $Zn$  dust; hot dil.  $HNO_3$  in sealed tubes yields phthalic acid. *Sodium salt*, pptd. from a  $NaOAc$  soln. by solid  $NaOAc$ , seps. in brown-red needles. *Dipotassium salt*, obtained by boiling (I) with a 6.5% soln. of  $KOAc$  in  $MeOH$ , adding  $H_2O$  until the salt is almost dissolved, filtering, cooling and allowing to stand 24 hrs., brown crystals with 2 mols. of  $H_2O$ , 1 of which it loses *in vacuo* over  $H_2SO_4$ . The  $Ag$  salt, a brown-red amorphous ppt. obtained by adding  $AgNO_3$  to the  $K$  salt in  $H_2O$ , when heated 1 hr. on the  $H_2O$  bath with a large excess of  $EtI$  in  $CS_2$ , filtered and quickly shaken with 0.5% aq. (crystd.)  $NaOAc$ , yields a red aq. soln. of the *monoethyl ester* which is at once pptd. with dil  $H_2SO_4$  and taken up in  $CHCl_3$ ; to avoid hydrolysis it should not be allowed to remain in the  $H_2O$  soln. more than 5-10 min. It seps. from  $EtI$  in fine, yellow, cryst. fibers or brown-yellow needles, m.  $149^\circ$ , sol. in org. solvents with yellow-red to yellow, in  $H_2SO_4$  with greenish yellow, in  $Na_2CO_3$  and  $NaOAc$  with red color, gives a violet-red color with alc.  $FeCl_3$ , yields on hydrolysis and treatment with  $CaCl_2$  the above  $Ca$  salt with 7  $H_2O$ . The  $CS_2$  soln. yields 2 *diethyl ether esters*, easily sol. yellow rhombohedral tables from alc. or  $CS_2$ , m.  $85.5-7.0^\circ$ , and less sol. yellow, prismatic needles, m.  $188^\circ$ ; neither gives a color with  $FeCl_3$ . C. A. R.

Synthesis of derivatives of [diethylaminoacetyl]salicylic acid. FRIEDRICH L. HAEN AND MILLY LOOS. Univ. Frankfurt a/M. *Ber.* 51, 1436-47(1918).—*Methyl chloroacetylsalicylate* (a),  $ClCH_2CO_2C_6H_4CO_2Me$ , m.  $62^\circ$ ,  $b_{20}$   $195-200^\circ$ , is obtained on 80-5% yield by slowly adding with cooling 25 g.  $ClCH_2COCl$  to 35 g.  $o-HOC_6H_4CO_2Me$  and 26 g.  $PhNMe_3$ , letting stand 5 hrs., decomp. with ice and dil.  $HCl$  and drying on clay and then *in vacuo* over  $CaO$ ; it may also be prepd. by heating 16 g.  $HOCH_2C_6H_4CO_2Me$  with 10 g.  $ClCH_2CO_2H$  and 5 g.  $PCl_5$  2 hrs. on the  $H_2O$  bath, pouring off from the  $H_3PO_3$ , rinsing with a little  $Et_2O$ , treating with 20 cc.  $PhNMe_3$  with cooling, shaking the following day with  $HCl$ , then with soda and drying the  $Et_2O$  soln. with  $Na_2SO_4$ . Of this, 23 g. are allowed to stand some time with 16 g.  $NaI$  in  $Me_2CO$  (whereby it is converted into the I compd.), freed from the  $Me_2CO$  under slightly diminished pressure, taken up in  $Et_2O$ , shaken with  $NaHSO_3$  or  $Na_2S_2O_3$ , dried with  $Na_2SO_4$  and slowly treated with cooling with 14 g.  $NHEt_3$ . The reaction takes place at once; the pptd.  $NHEt_3 \cdot HI$  (14 g.) is filtered off, the  $Et_2O$  evapd., the residue gently warmed *in vacuo* to remove the excess of  $NHEt_3$ , then dissolved in  $AcOEt$ , treated cold with  $HCl$  gas until acid to Congo and filtered after some time. There is thus obtained 8 g. of the *hydrochloride*, white cryst. ppt., m.  $131^\circ$ , of *methyl [diethylaminoacetyl]salicylate*, m.  $58-9^\circ$ ; *picrate*, m.  $147^\circ$ . *Ethyl chloroacetylsalicylate*, m.  $67^\circ$ ,  $b_{20}$   $130^\circ$ . *Ethyl [diethylaminoacetyl]salicylate*,  $b_{11}$   $136-46^\circ$ ; *picrate*, fine needles from dil. alc., m.  $138^\circ$ ; *chloroplatinate*, m.  $161-2^\circ$ . If the  $NHEt_3$  is allowed to react with (a) instead of the I compd. and worked up as above, the product is *diethylaminoacetyl diethylamide* (b),  $b_{20}$   $134-6^\circ$  (*picrate*, hydrated crystals from alc., m.  $133^\circ$ ), and the  $Et_2O$  soln., after shaking with  $HCl$ , leaves as residue almost the calcd. amt. of  $HOCH_2C_6H_4CO_2Me$ .  $ClCH_2COCl$  and  $NHEt_3$  in cold  $Et_2O$  yield *chloroacetyl diethylamide*,  $b_{20}$   $190-5^\circ$ , strongly irritating to the eyes, which, treated in  $Me_2CO$  with  $NaI$ , freed from  $Me_2CO$  and treated in  $Et_2O$  with  $NHEt_3$ , gives an oil forming a *picrate* identical with that of (b). *Chloroacetylsalicylyl chloride* (c), obtained quant. by treating 20 g.  $ClCH_2CO_2C_6H_4CO_2H$  and a little  $POCl_3$  with 20 g.  $PCl_5$ , warming on a gently boiling  $H_2O$  bath until a clear soln. results (about 1 hr.),

freeing from  $\text{POCl}_3$  *in vacuo* on the  $\text{H}_2\text{O}$  bath, dissolving in  $\text{Et}_2\text{O}$ , filtering and freeing from  $\text{Et}_2\text{O}$  on the  $\text{H}_2\text{O}$  bath,  $b_p$  165–70°. From 5 g. (c) in 30 cc. cold  $\text{AcOEt}$  and 4 g.  $\text{PhNH}_2$  is obtained 5 g. *chloroacetylsalicylanilide*, m. 121°, also obtained in 80% yield from 12 g. of the well dried K salt of  $o\text{-HOC}_6\text{H}_4\text{CONHPh}$  and 6.3 g.  $\text{ClCH}_2\text{COCl}$  in 50 cc.  $\text{AcOEt}$ ; with  $\text{NaI}$  in  $\text{Me}_2\text{CO}$  it gives the *iodo compound*, white crystals, turns brown 118°, m. 128°; this, allowed to stand in cooled  $\text{AcOEt}$  with  $\text{NHEt}_3$ , gives [*diethylaminoacetyl*]salicylanilide, m. 129–30°; *hydrochloride*, m. 131–3°. *Chloroacetylsalicylamide* (d), needles, m. 160°, is obtained in 60% yield by treating the chloride and a trace of  $p\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$  in cold  $\text{Et}_2\text{O}$  with dry  $\text{NH}_3$  to appearance of a yellow color, also, in very poor yield, by rubbing the chloride with  $(\text{NH}_4)_2\text{CO}_3$  until its odor disappears. *Chloroacetylsalicyl*[*chloroacetylamine*],  $\text{ClCH}_2\text{CO}_2\text{C}_6\text{H}_4\text{CONHCOCH}_2\text{Cl}$ , silky needles, m. 133–4°, from 8 g.  $\text{HOC}_6\text{H}_4\text{CONH}_2$ , 18 g.  $\text{PhNMe}_2$  and 16.5 g.  $\text{ClCH}_2\text{COCl}$  allowed to stand some time, is stable in the solid state and in non-aq. solns.; in aq. solns., especially on warming, the acyl groups are split off; cleavage of that on the N alone can easily be affected by quickly dissolving 3 g. of the compd. in 3 cc. warm alc. and pouring into 100 cc.  $\text{H}_2\text{O}$  containing 0.7 cc. of 25%  $\text{NH}_4\text{OH}$ ; (d) at once seps. as a milky turbidity quickly changing to a cryst. ppt. *Iodoacetylsalicylamide*, decomp. 138–9°. [*Diethylaminoacetyl*]salicylamide *hydrochloride*, obtained in 85% yield from 5 g. (d) in  $\text{Me}_2\text{CO}$  allowed to stand some hrs. with 3.5 g.  $\text{NHEt}_3$ , then treated with a little  $\text{Et}_2\text{O}$  to complete the pptn. of  $\text{NHEt}_3\text{HCl}$ , filtered and made acid to Congo with alc.  $\text{HCl}$ , m. 195–6°; free base, seps. with 0.5 mol.  $\text{H}_2\text{O}$ , m. 144–5°. The  $\text{HCl}$  salt in  $\text{H}_2\text{O}$  containing a little  $\text{HCl}$  gives with concd.  $\text{NaNO}_2$  a white ppt. whose m. p. varies somewhat in different preps., the highest observed being 110°. It seems to consist chiefly of the nitrite contaminated with more or less of the free base; its soln., on warming or long standing, partially decomp. with formation of green tars and partially hydrolyzes with deposition of the base.

CHAS. A. ROUILLER.

**Fluorides of organo-metallic compounds. I. Triaryltin fluorides and dialkyltin difluorides.** ERICH KRAUSE. Techn. Hochschule, Berlin. *Ber.* 51, 1447–56(1918).—Unlike the chlorides, bromides and iodides, the triaryltin fluorides are solids, odorless, with very high m. ps., subliming before melting, distinctly sol. in  $\text{H}_2\text{O}$  with acid reaction, very difficultly sol. in indifferent org. solvents ( $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$ ), more easily in alcs. and  $\text{AcOH}$ . Likewise the dialkyltin difluorides melt very high, are almost insol. in indifferent org. solvents, slightly sol. in  $\text{EtOH}$ , more in  $\text{MeOH}$  and  $\text{H}_2\text{O}$  (with acid reaction); with neutral alkali fluorides they form sol. double salts. The trialkyl compds. can be obtained quant. by treating solns. of the hydroxides (*C. A.* 12, 1883) with aq.  $\text{HF}$  and crystg. the resulting ppts. from hot  $\text{EtOH}$ ; they sep. in felted, doubly refracting prisms which become strongly electrified on rubbing. They are more conveniently prepd. by treating the other halides in alc. with excess of aq. neutral  $\text{KF}$ . This reaction is reversible; on treating the fluorides with concd.  $\text{KCl}$ ,  $\text{KBr}$  or  $\text{KI}$  the unpleasant odors of the  $\text{Cl}$ ,  $\text{Br}$  and  $\text{I}$  compds. soon develop; by gently warming with the fuming halogen acids this reverse change can be made quant. The dialkyl difluorides are obtained almost quant. in the same way with the exactly calcd. amts. of alkali fluorides and sep. from  $\text{MeOH}$  in cryst. powders of fine, thin, doubly refracting needles, which do not become markedly electrified on rubbing. These compds. are very useful in prepg. mixed Sn tetraalkyls as they react energetically with alkylmagnesium halides, and also in sepg. trialkyltin halides from the tetraaryl compds. by shaking the concd.  $\text{Et}_2\text{O}$  solns. of the latter with neutral aq.  $\text{KF}$  and alc. The soly. values given below represent the amts. in g. sol. in 100 g.  $\text{MeOH}$ ,  $\text{EtOH}$ ,  $\text{H}_2\text{O}$  and  $\text{C}_6\text{H}_6$ , resp. The m. ps. (in sealed tubes) are cor. *Trimethyltin fluoride*, does not change in a sealed tube up to 360°, then begins to turn brown and blackens and shrinks together about 375°; soly. 2.45, 1.08, 0.846 and 0.05 at 31.3°. *Triethyltin fluoride*, begins to sublime above

180°, m. in a sealed tube 302°, soly. 4.39, 2.20, 0.182 and 0.034 at 32.2°. *Tripropyltin fluoride*, m. 275°, soly. 4.26, 2.73, 0.020 and 0.118 at 31.3°. *Triisobutyltin fluoride*, m. 244°, soly. 0.614, 0.414, 0.012 and 0.100 at 31.6°. *Triisooamyltin fluoride*, m. 288°, soly. 1.22, 1.03, 0.003 and 0.967 at 31.3°. *Diethylpropyltin fluoride*, from  $\text{Et}_3\text{SnPr}$  in  $\text{CHCl}_3$  treated with Br and then shaken with aq. KF, m. 271°, soly. 6.93, 3.78, 0.12 and 0.05 at 31.0°. *Dimethyltin difluoride*, decomps. above 360°, soly. 0.33, 0.081 and 4.66 in MeOH, EtOH and  $\text{H}_2\text{O}$  at 30.7°. *Diethyltin difluoride*, seps. from MeOH in quadratic plates or elongated rhombic tables with varying amts. of solvent, m. around 229° (uncor.); after 1 hr. at 110° *in vacuo* over  $\text{P}_2\text{O}_5$  it sinters about 240° and m. 287–90° (depending on the rate of heating), soly. 2.64, 0.45, 2.03 and 0.047 at 30.8°; 0.1 mol. treated with warm neutral KF until a clear soln. results (almost exactly 0.2 mol. KF is required), then with 5 times this amt. of KF and then concd. to incipient crystn., yields on cooling the double salt  $\text{Et}_2\text{SnF}_2 \cdot 2\text{KF}$  in leaflets. *Dispropyltin difluoride*, sinters 200°, m. 204–5° (uncor.), sol. 1.91, 0.93 and 0.22 in MeOH, EtOH and  $\text{H}_2\text{O}$  at 32°.  $\text{Et}_3\text{SnPr}$ , from  $\text{Et}_3\text{SnF}$  and  $\text{PhMgCl}$ ,  $b_{11}$  82°, shows  $d_4^{18.6}$  1.1710,  $n_D^{18.6}$  1.47065, 1.47410, 1.48249, 1.48965 for  $H_\alpha$ , D,  $H_\beta$  and  $H_\gamma$  at 16.6°. The (iso-Am) $\text{Sn}$  prepd. in the usual way from  $\text{SnCl}_4$  and iso-AmMgCl and purified by treating with aq. neutral KF and alc.  $b_m$  188° (uncor.),  $d_4^{18.6}$  1.0353,  $n_D^{18.6}$  1.46946, 1.47242, 1.47989, 1.48607 for  $H_\alpha$ , D,  $H_\beta$  and  $H_\gamma$  at 16.0°. CHAS. A. ROULLER.

**Luminescence phenomena in pyrazoline derivatives.** FRITZ STRAUS, with CARL MUFFAT and W. HEITZ. Univ. Strassburg i. Els. *Ber.* 51, 1457–77 (1918); cf. Auwers and Voss, *C. A.* 4, 586.—The reaction whereby 1-phenylpyrazolines are obtained by the action of  $\text{PhNHNH}_2$  on certain aromatic ketones, owing to the extraordinary ease with which the hydrazones first formed rearrange, has been extended to a number of substituted ketones and hydrazines.  $\text{PhCH:CHCOCH:CHPh}$  reacts in this way, so that adopting Auwers' scheme of classification,  $\text{PhCH:CHCOR'}$ , the grouping  $\text{PhCH:CH}$  falls in with aromatic and sec. or tert. aliphatic residues in favoring ring closure. The  $\alpha$ - and  $\beta$ -naphthylhydrazones form the pyrazolines as easily as the Ph compds.  $\text{NO}_2$  groups in the  $p$ -position in the hydrazine residue and  $o$ - but not  $p$ -MeO groups in the ketone Ph residues make the ring closure more difficult. Halogens do not markedly hinder the pyrazoline formation as long as they are present only in the ketone or the hydrazine residue, but if present in both they render the hydrazones quite stable. These pyrazoline compds. show vivid fluorescence under the influence of Röntgen rays, almost as intense as that of  $\text{BaPt(CN)}_4$  in some cases, and not only in the solid state but in soln. also, depending to a marked degree on the nature of the solvent; the alc. and AcOH solns. become only faintly luminescent while in  $\text{CS}_2$ ,  $\text{C}_6\text{H}_6$  and  $\text{CHCl}_3$  the phenomenon is surprisingly intense. The compds. also show vivid fluorescence in diffuse daylight. The fluorescence produced in these 1,3,5-substituted pyrazolines by Röntgen rays differs from that produced by daylight, however, in that it is limited to those compds. in which an unsatd. residue (Ph or CO) is substituted in positions 3 and 5; where the limit for the daylight fluorescence lies has not been detd. with certainty but as fluorescence of simple pyrazolines is nowhere mentioned, it is probably produced by a Ph group in position 1. The hydrazones first formed, which have been isolated in some cases, are intensely colored, even more so than their isomeric pyrazolines, but show no fluorescence. The pyrazoline ring, however, is not in itself the seat of the fluorescence phenomenon; the cyclic compds. resulting from the phenylhydrazones of cinnamylideneacetophenone and dicinnamylideneacetone, which do not contain a pyrazoline ring, also fluoresce under the influence of Röntgen rays. The intensity of the fluorescence depends on the nature of the substituents, increasing in the order below with the following substituents in positions 1, 3 and 5, resp.: Ph, Ph, Ph; Ph,  $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CH:CH}$ ,  $p\text{-Me}_2\text{NC}_6\text{H}_4$ ; Ph,  $\text{PhCH:CH}$ , Ph; Ph,  $p\text{-ClC}_6\text{H}_4$ .

$p\text{-ClC}_6\text{H}_4$ ; Ph,  $p\text{-MeOC}_6\text{H}_4\text{CH:CH}$ ,  $p\text{-MeOC}_6\text{H}_4$ ; Ph,  $p\text{-ClC}_6\text{H}_4\text{CH:CH}$ ,  $p\text{-ClC}_6\text{H}_4$ ;  $p\text{-BrC}_6\text{H}_4$ ,  $p\text{-ClC}_6\text{H}_4\text{CH:CH}$ ,  $p\text{-ClC}_6\text{H}_4$ .  $\text{O}_2\text{NC}_6\text{H}_4$  in position 1 destroys the fluorescence under the rays but not in daylight;  $1\text{-}\alpha\text{-}$  and  $\beta\text{-C}_{10}\text{H}_7$  derivs. fluoresce. This fluorescence under Röntgen rays is not limited to these pyrazolines, however; it is found, partly in conjunction with ordinary fluorescence, in Ph-substituted ethylenes, butadienes and hexatrienes; the Ph-substituted acetylenes show it faintly;  $\text{Ph}_3\text{CH}$  very brightly; CPh, not at all; anthracene and retene very faintly; *ms*-dibromoanthracene intensely; hydrocollidinedicarboxylic ester quite strongly. The constitutions of the following hydrazones and pyrazolines were detd. by the methods of A. and V. 1,5-Diphenyl-3-styrylpyrazoline,  $\text{PhN.N:C(CH:CHPh).CH}_2\text{CHPh}$ , m.  $147\text{--}8^\circ$  (Minunni,

*Gass. chim. ital.* 29, II, 398(1899)), evapd. to dryness with 2%  $\text{KMnO}_4$ , gave  $\text{BzOH}$  and 1,5-diphenylpyrazole-3-carboxylic acid, needles from  $\text{H}_2\text{O}$ , m.  $183^\circ$ ; the pyrazoline is unchanged by Na-Hg and by boiling with  $\text{AcOH}$ ; it dissolves in  $\text{H}_2\text{SO}_4$  with golden yellow color and gives with  $\text{FeCl}_3$  a green color changing to blue. *1- $\alpha$ -Naphthyl-3-styryl-5-phenylpyrazoline*, obtained by filtering a hot soln. of 5 g.  $\alpha\text{-C}_{10}\text{H}_7\text{NHNH}_2\text{HCl}$  and 2.7 g. KOAc in 200 g. abs. alc. from the pptd. KCl, boiling 1 hr. with 5 g.  $(\text{PhCH:CH})_2\text{CO}$  in 100 cc. alc., then 0.5 hr. longer with charcoal, filtering, concg. *in vacuo* to 0.5 its vol., pouring off the alc. after cooling and drying *in vacuo* over  $\text{H}_2\text{SO}_4$ , yellow needles with green fluorescence from abs. alc. containing some  $\text{AcOEt}$ , m.  $164^\circ$ .  *$\beta$ -Isomer*, yellow, felted needles with faint green fluorescence from  $\text{AcOEt}$ , m.  $195^\circ$ . *1-p-Bromophenyl-3-styryl-5-phenylpyrazoline*, from 4 g.  $(\text{PhCH:CH})_2\text{CO}$  allowed to stand 2 days with 5 g.  $p\text{-BrC}_6\text{H}_4\text{NHNH}_2$  in 20 cc.  $\text{AcOH}$ , yellow needles with green fluorescence from  $\text{AcOEt}$ , m.  $177^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with dirty green color changing to deep green on addition of  $\text{FeCl}_3$ , unchanged by Na-Hg or boiling  $\text{AcOH}$ . From 4.5 g.  $(\text{PhCH:CH})_2\text{CO}$  boiled 3 hrs. with 3 g.  $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$  in alc. and a little  $\text{AcOH}$  and allowed to stand several days is obtained *dibenzalacetone p-nitrophenylhydrazone*, yellow-red leaflets from  $\text{C}_6\text{H}_6$ , m.  $173^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with red-yellow color; 1.7 g. in 20 cc.  $\text{AcOEt}$  and 10 cc.  $\text{AcOH}$  reduced with 60 g. Na-Hg gave 0.5 g. crude solid  $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ , while boiling 1 hr. in 20 parts  $\text{AcOH}$  converts it into *1-p-nitrophenyl-3-styryl-5-phenylpyrazoline*, yellow-red crystals with intense green fluorescence from  $\text{AcOEt}$ , m.  $204\text{--}5^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with red-violet color hardly changed by  $\text{FeCl}_3$ . *o,o'-Dimethoxydibenzalacetone phenylhydrazone*, brown-yellow warts from alc., m.  $142^\circ$ , reduced by Na-Hg in  $\text{EtOH-AcOH}$  to  $\text{PhNH}_2$  and rearranged by boiling  $\text{AcOH}$  into *1-phenyl-3-o-methoxystyryl-5-o-methoxyphenylpyrazoline*, light yellow crystals from alc. (in which they form a soln. with green-blue fluorescence), m.  $153\text{--}4.5^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with red-yellow color changed to blue by  $\text{FeCl}_3$ , gives no  $\text{PhNH}_2$  with Na-Hg. *1-Phenyl-3-p-methoxystyryl-5-p-methoxyphenylpyrazoline*, from 5 g. dianisalacetone and 5 g.  $\text{PhNHNH}_2$ , boiled 2 hrs. in 50 cc.  $\text{C}_6\text{H}_6$ , white-yellow leaflets (appearing almost green from their intense fluorescence) from  $\text{AcOEt}$ , m.  $159^\circ$ ; it is more easily obtained by boiling the ketone and hydrazine 5 min. in 10 parts  $\text{AcOH}$ . *1-Phenyl-3-p-dimethylaminostyryl-5-p-dimethylaminophenylpyrazoline*, yellow needles with extraordinarily intense green fluorescence from  $\text{AcOEt}$ , m.  $192^\circ$ . *o,o'-Dichlorodibenzalacetone*, obtained in rather poor yield by boiling 5 g.  $o\text{-ClC}_6\text{H}_4\text{CHO}$  and 1 g.  $\text{Me}_2\text{CO}$  in 60 cc. alc. 15 min. with 3 cc. of 5% NaOMe. yellow needles from MeOH, m.  $125^\circ$ ; *p-bromophenylhydrazone*, dark yellow, crystals from MeOH, m.  $145^\circ$ . *1-Phenyl-3-o-chlorostyryl-5-o-chlorophenylpyrazoline*, yellow needles from alc. (the soln. shows green fluorescence), m.  $145^\circ$ , sol. in  $\text{H}_2\text{SO}_4$  with yellow-green color turned dark by  $\text{FeCl}_3$ , unchanged by boiling  $\text{AcOH}$ . *1-Phenyl-3-p-chlorostyryl-5-p-chlorophenylpyrazoline*, fine, yellow needles with strong green fluorescence from  $\text{AcOEt}$ , m.  $212^\circ$ , gives no  $\text{PhNH}_2$  with Na-Hg, gives so faint a reaction with  $\text{FeCl}_3$  in  $\text{H}_2\text{SO}_4$  as not to reveal the presence of a pyrazoline. *p,p-Dichlorodibenzalacetone*



*p*-bromophenylhydrazones, from 5 g. of the ketone and 3.5 g. of the hydrazine shaken 3 days, protected from the light, in 50 cc. AcOH yellow needles from  $C_6H_6$ , m.  $183^\circ$ , stable only in  $H_2$ , quickly turns brown in the air, sol. in  $H_2SO_4$  with yellow color changed transiently green, then brown, by  $FeCl_3$ , reduced by Na-Hg in EtOH-AcOH to *p*- $BrC_6H_4NH_2$  and converted by boiling AcOH into *1-p*-bromophenyl-3-*p*-chlorostyryl-5-*p*-chlorophenylpyrazoline, yellow needles with intense green fluorescence from alc., m.  $173-4^\circ$ , sol. in  $H_2SO_4$  with yellow color changed to deep green by  $FeCl_3$ , unchanged by Na-Hg. Methyl 1-phenyl-3- $\beta$ -carbomethoxyvinylpyrazoline-5-carboxylate,  $PhN.N:C(CH:CHCO_2Me).CH_2.CHCO_2Me$ , from  $CO(CH:CHCO_2Me)_2$  and  $PhNHNH_2$ ,  
 $\text{PhN.N:C(CH:CHCO}_2\text{Me).CH}_2\text{.CHCO}_2\text{Me}$

in boiling  $C_6H_6$ , yellow leaflets with green fluorescence from AcOEt, m.  $153^\circ$ , sol. in  $H_2SO_4$  with red-yellow color changed to dark blue by  $FeCl_3$  (yield rather poor), unchanged by boiling AcOH. Ethyl ester, yellow leaflets with green fluorescence, m.  $92.5^\circ$ , hydrolyzed by aq. alc. NaOH on the  $H_2O$  bath to the free dicarboxylic acid, yellow needles, m.  $204^\circ$  (decompn.); Pb salt, yellow, finely granular ppt. Dimethyl ketopentadienedicarboxylate phenylmethylhydrazone, from the ester and the hydrazine in AcOH at  $40^\circ$ , dark red, refractive crystals from MeOH, m.  $105^\circ$ . Diethyl ester *p*-bromophenylhydrazone, deep red-yellow needles from MeOH, m.  $134^\circ$ . From 5 g. of A. and V.'s  $PhCH:CHCH:CHC:(NNHPh)Ph$  boiled 1 hr. with 20 cc. AcOH is obtained an isomer (a), probably  $PhN.N:CPh.CH:CH.CH_2.CHPh$  or  $PhN.N:CPh.CH_2.CH:CH.CHPh$ ,  
 $\text{PhN.N:CPh.CH:CH.CH}_2\text{.CHPh}$  or  $\text{PhN.N:CPh.CH}_2\text{.CH:CH.CHPh}$

warts with faint fluorescence from AcOH, m.  $123-4^\circ$ , sol. in  $H_2SO_4$  with green-blue color changed to green by  $FeCl_3$ , while the hydrazone dissolves with yellow color changed to brown by  $FeCl_3$ ; Na-Hg gives no  $PhNH_2$  but resinifies the substance.  $PhCH:CHCH:CHC:(NNHPh)Me$  dissolves in  $H_2SO_4$  with red-yellow color changed to dirty green by  $FeCl_3$ , yields  $PhNH_2$  with Na-Hg and is converted by boiling AcOH into an oil strongly fluorescing in  $C_6H_6$  and whose red-yellow soln. in  $H_2SO_4$  is turned blue-red by  $FeCl_3$ , while Na-Hg gives no  $PhNH_2$ .  $(PhCH:CHCH:CH)_2O$  and  $PhNHNH_2$  heated in AcOH and then in alc. give orange-yellow needles from alc. and AcOEt, m.  $142^\circ$  (Diel and Einhorn, *Ber.* 18, 2325 (1885), describe a "phenylhydrazone" as m.  $155^\circ$ ), dissolves in  $H_2SO_4$  with orange-red color changing to blue on standing 10 sec. or adding  $FeCl_3$ , gives no  $PhNH_2$  with Na-Hg but is resinified, is unchanged by AcOH. Evidently the substance is not a hydrazone but a cyclic compd. analogous to (a) above. On oxidation with  $KMnO_4$ , BzOH was the only product which could be isolated.

CHAS. A. ROULLER.

The ester acids of  $\alpha,\alpha'$ -dimethylcinchomeronic acid. RUD. WEGSCHIEDER. Univ. Wien. *Ber.* 51, 1478-9(1918); cf. Mumm and Hüneke, *C. A.* 12, 1878.—M. and H. prepd. the isomeric mono-Et esters of the acid, one by half-sapon. of the di-Et ester with HCl or KOH, the other by the action of alc. on the anhydride, and concluded that the former is the  $\beta$ -ester on the ground that the sterically non-hindered  $CO_2Et$  is much more easily attacked; likewise they assume that steric hindrance plays a part in the formation of the second from the anhydride and consider the method of formation a confirmation of the  $\gamma$ -position of the  $CO_2Et$  group. Their conclusion from the half sapon. may be considered as quite probable, although instances are known where the more strongly hindered  $CO_2H$  group is chiefly attacked on half-sapon., and therefore only the  $\gamma$ -structure remains for the other ester, but its constitution cannot be derived from the fact that it is formed from the anhydride, for W. has shown that in such cases it is generally not steric hindrance but the strength of the  $CO_2H$  group which has the greatest influence, the alkyl going to the more strongly acid group. But in this case, even his rule cannot serve in detg. the constitution of the ester formed from the anhydride, for the relative strengths of the  $CO_2H$  groups in a di- $CO_2H$  acid containing

N cannot be predicted with certainty, in the majority of cases, including the present one, owing to the complications arising from the formation of inner salts, etc.

CHAS. A. ROUILLER.

**Molecular rearrangements. XIII. Phenyl migrations.** P. J. MONTAGNE. Univ. Leiden. *Ber.* 51, 1479-88(1918); cf. *C. A.* 4, 2821.—The results of the present investigation confirm those reported in the earlier papers and also those of other workers that when there is an intramol. migration of a Ph group the latter is attached before and after the rearrangement through the same C atom, *i. e.*, the substituents remain in the same positions so that it is perfectly justifiable, *e. g.*, to deduce the structure of the benzophenones from the rearrangement products of their oximes. Thus the oxime, m. 151.5°, of (*p*-BrC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CO, whose structure has been established beyond doubt (*C. A.* 9, 2533), gives with PCl<sub>5</sub> in Et<sub>2</sub>O a *bromobenzobromoanilide*, BrC<sub>6</sub>H<sub>4</sub>CONHC<sub>6</sub>H<sub>4</sub>Br, m. 223.5°, which with alc. KOH in sealed tubes on the H<sub>2</sub>O bath yields *p*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, m. 63°, and *p*-BrC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H, m. 254°, so that in the rearrangement product, just as in the original oxime, both Br atoms are in the *p*-positions. Hoffmann's (IC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CO, for which he assumed the *p,p'*-structure without proof (*Ann.* 264, 165(1891)) (by working in sunlight, M. has succeeded in increasing the yield from 4.5 to 18%; his product b<sub>12</sub> 281°, m. 238.5°), yields on rearrangement of its oxime, m. 173°, *p*-iodobenz-*p*-iodoanilide, m. 287°, the structure of which is proved by its synthesis from *p*-IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> and *p*-IC<sub>6</sub>H<sub>4</sub>COCN in Et<sub>2</sub>O; therefore, by the rule of Ph migration, the phenone really has the *p,p'*-structure assumed by H. This is further proved by nitrating it with cold HNO<sub>3</sub> (d. 1.5); this gives 4,4'-diiodo-3,3'-dinitrobenzophenone, yellow crystals from C<sub>6</sub>H<sub>6</sub>, m. 185.5°, for with alc. NH<sub>3</sub> at 150° it yields the known [4,3-H<sub>2</sub>N(O<sub>2</sub>N)-C<sub>6</sub>H<sub>4</sub>]<sub>2</sub>CO, m. 293°.

CHAS. A. ROUILLER.

**Acetylation of 4-iodoaniline by acetic anhydride.** P. J. MONTAGNE. Univ. Leiden. *Ber.* 51, 1489-92(1918).—*p*-IC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>, light yellow crystals from AcOEt, b<sub>77</sub> 289°, m. 174°, is obtained in 95% yield by v. Baeyer's method; when 25 g. in 250 cc. Me<sub>2</sub>CO is treated with 75 g. crystd. SnCl<sub>2</sub> and 75 cc. HCl (d. 1.19), allowed to stand 15 min., treated with H<sub>2</sub>O and an excess of KOH, freed from Me<sub>2</sub>CO on the H<sub>2</sub>O bath and allowed to stand overnight, it gives 80% *p*-IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>, m. 62.75°. When 5 g. are boiled 15 min., 2.5 hrs. or 6 hrs. with 50 cc. Ac<sub>2</sub>O, there are obtained a mixt. of IC<sub>6</sub>H<sub>4</sub>NHAc, m. 184.5°, and *p*-iododiacetanilide, m. 108.5°; if the mixt. of IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> and Ac<sub>2</sub>O is gently warmed (not boiled) until all dissolves and at once poured into H<sub>2</sub>O, only the mono-Ac deriv. is formed. In all these expts. the alc. soln. of the ppt. formed when the Ac<sub>2</sub>O soln. is poured into H<sub>2</sub>O deposits on cooling small amts. of glittering platelets, m. 204.5°, which were obtained in too small amt. for further investigation. The mono-Ac compd. boiled 6 hrs. with 10 parts Ac<sub>2</sub>O gives the di-Ac deriv. The latter boiled 2 hrs. with 1:5 H<sub>2</sub>SO<sub>4</sub> is hydrolyzed to IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>.

CHAS. A. ROUILLER.

**Solubilities, separation, and purification of anthracene, carbazole and phenanthrene.** JOHN M. CLARK. *J. Ind. Eng. Chem.* 11, 204-9(1919).—Methods for the purification of carbazole and anthracene are given together with the relative solubilities of anthracene, carbazole and phenanthrene in 14 organic solvents. Some general information relative to crude coal tars is included.

J. H. YOUNG.

Investigations on Pasteur's principle concerning the relation between molecular and crystallonomical dissymmetry (JÄGER) 2. Gases used in warfare (BEROLZHEIMER) 2. Bibliography on carbonyl chloride and its derivatives (BEROLZHEIMER) 2.

STEWART, ALFRED W.: *Recent Advances in Organic Chemistry*. 3rd Ed. London: Longmans, Green & Co. 350 pp. 14s. net. For review see *Chem. Trade J.* 64, 97(1919) or *Pharm. J.* 102, 44(1919).

**Dehydrating pyridine.** C. R. DOWNS. U. S. 1,290,124, Jan. 7. Pyridine containing  $H_2O$ , *e. g.*, 15%  $H_2O$ , is mixed with sufficient  $C_6H_6$  to give a proportion, by weight, of 10.325 to 1 of  $C_6H_6$  to  $H_2O$ . In this proportion, the  $C_6H_6$  and  $H_2O$  form a binary mixt. which boils constantly at about  $69.5^\circ$ . The mixt. of  $C_6H_6$ ,  $H_2O$  and pyridine then subjected to fractional distn., preferably in a column still with collection of 3 fractions, *vis.*, below  $80^\circ$ ,  $80-115^\circ$  and above  $115^\circ$ . When the distn. is thus conducted, the first fraction contains nearly all the  $H_2O$ , the second fraction contains substantially all the remainder of the  $H_2O$ , some  $C_6H_6$  and a small amount of pyridine bases, and the last fraction contains substantially all the pyridine and pyridine bases. The process may be somewhat simplified by distg. in two fractions only, in which case a first fraction is obtained consisting of  $H_2O$  and  $C_6H_6$  and a second fraction containing pyridine or pyridine bases. The first fraction (b. below  $80^\circ$ ) seps. into 2 layers; a lower aq. layer (containing only about 0.2% of the pyridine bases so that it may be discarded) and an upper  $C_6H_6$  layer containing a larger proportion of pyridine bases. This upper layer may be added to the next batch for further distn. to recover the pyridine bases from it. The second fraction, containing very little  $H_2O$  mixed with  $C_6H_6$  and some pyridine, is returned to the still for the next distn. to recover the pyridine which it contains. The last fraction consists of pyridine or pyridine bases nearly free from  $H_2O$ . As a preliminary treatment of the pyridine, containing  $H_2O$ , it may be mixed with either  $C_6H_6$  or a satd. NaCl soln. and  $C_6H_6$  and shaken and then allowed to settle to effect sepn. of an aq. layer before distg.

**1,2,4-Methylhydroxyisopropylbenzene.** R. H. MCKEE. Can. 188,518, Feb. 4, 1919. 1,2,4-Me(OH)(Me<sub>2</sub>CH) $C_6H_3$  is produced by sulfonating "spruce turpentine," forming an alkali metal salt of the resulting acid, fusing the salt with caustic alkali, dissolving the resulting mass and neutralizing the resulting alk. soln.

**Carbazole.** SOC. D'ECLAIRAGE CHAUFFAGE ET FORCE MOTRICE. Brit. 121,455, Oct. 7, 1918. Crude carbazole is purified by dissolving it in a phenol (phenol, cresols, xlenols) and crystg. out. The crystals are washed with a phenol and the process is repeated, giving a product of 90% purity. The process may be applied to the crude carbazole contained in the pyridine solns. from the purification of anthracene by pyridine, or to the crude carbazole obtained by decomp. K carbazole produced in purifying anthracene by KOH.

**Acetic acid from acetaldehyde.** S. UTHEIM. Norw. 29,011, Aug. 12, 1918.  $CH_3CHO$  is treated with an oxidizing gas under pressure, the reacting substances being introduced separately into a restricted reaction chamber in limited quantities, so that the oxidizing gases can act only on small quantities of the acetaldehyde at any one time.

## 11. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

The photochemical effect of certain fluorescent substances on rennin. JANET HOWELL CLARK. *Am. J. Physiol.* 47, 251-64 (1918).—Fluorescent materials have a destructive effect on rennin in sunlight because they are decomposed by light of certain wave lengths yielding toxic substances.

J. F. LYMAN.

**Penetration of antiseptics into solid media.** P. CARNOT AND J. DUMONT. *Compt. rend. soc. biol.* 81, 1199-1200 (1918).—C. and D. propose the following technic for studying the penetration of antiseptics into solid media *in vitro*: Liquid gelose con-

taining suitable nutrient substances is poured into a Petri dish so as to form a rather thick layer. A hollow cylinder of glass or porcelain with a series of indentations in the circumference of the lower opening is placed in the center of the mass before the latter solidifies. After the gelose has solidified a const. amt. of an aq. soln. of the antiseptic to be studied is poured into the cylinder. The Petri dish and contents are placed in an incubator immediately or after several hrs. and the contents are examd. 24 hrs. afterward. The antiseptic diffuses into the gelose and bacterial growth is found to occur only in the periphery of the gelose mass, thus leaving a clear, sterile circle, the diam. of which (expressed in mm.) gives a numerical comparison of the sterilizing value of the various antiseptics studied. In the case of certain antiseptics ( $\text{AcOH}$ ,  $\text{HgCl}_2$ ) the colonies which constitute the circumference of this circle are less numerous but more luxuriant and chromogenic than those occurring in the peripheral part of the gelose mass; this result is due to the favorable action of these antiseptics when present in small, optimum concn. Addition of formic acid or  $\text{AcOH}$  to solns. of  $\text{HgCl}_2$ ,  $\text{NaF}$ ,  $\text{Cu}$  salts, etc., greatly increased the penetration of the latter into gelose. By means of these expts. it may be possible to obtain an idea of the relative degree of penetration of various antiseptics into wounds.

H. S. PAINE.

HODGE, C. F. AND DAWSON, JEAN: *Civic Biology*. Boston: Ginn & Co. 381 pp. \$1.60. For review see *Plant World* 21, 261(1919).

HUNTER, JOHN A.: *Alcohol and Life*. New York: The Macmillan Co. 86 pp. \$0.50.

SADTLER, S. P. AND COBLENTZ, VIRGIL: *Textbook of Chemistry for Pharmaceutical and Medical Students*. 5th Ed. Philadelphia: P. Blakiston's Son & Co. 765 pp. Cf. *C. A.* 10, 3079.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

The determination of tyrosine in proteins. CARL O. JOHNS AND D. BREESE JONES. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 36, 319-22(1918).—The figures obtained by the colorimetric method of Folin and Denis (*C. A.* 6, 3433) for the % of tyrosine in proteins are probably more accurate than those obtained by direct isolation as it is practically impossible to crystallize out all of the tyrosine from the hydrolysates of most proteins. The hydrolysis of the protein with 20%  $\text{HCl}$  should not be continued longer than 12 hrs. since tyrosine is slowly decomposed by boiling  $\text{HCl}$ . Tryptophan is completely decomposed during the hydrolysis and the decompn. products do not interfere with the colorimetric detn. of tyrosine. Oxyproline does not interfere with the detn. and hydrolysates of gelatin, which contains up to 6% of oxyproline, gave but little color with the reagent; this color was probably due to tyrosine in the gelatin since a test for tyrosine was obtained with Millon's reagent.

A. P. LOTEROP.

The quantitative determination of phosphorus by the nephelometric method. EDWARD B. METCS. U. S. Dept. Agr., Bur. Animal Ind. *J. Biol. Chem.* 36, 335-46 (1918).—In the quant. detn. of phosphorus by the nephelometric method, temp. and the character of the strychnine molybdate reagent as detd. by its age and by other factors are matters of the greatest importance. Very large deviations from what may be called the theoretical readings may be caused by the character of the reagent and by the amt. of  $\text{HCl}$  present at the time the phosphate suspensions are made. When the strychnine molybdate reagent is prepared according to the directions given by Kober and Egerer (*C. A.* 9, 2855), the stability and other important qualities of the reagent depend, to a surprizing extent, on the strength of the  $\text{HCl}$  used in prepg. it and this concn. must be known with great exactness. Com.  $\text{HCl}$  advertized on the bottle to contain 37% generally contains only about 35% and differences of this order in the

concn. of the HCl used produce very marked differences in the character of the strychnine molybdate reagent. If the densities of phosphate suspensions are to be calcd. from their nephelometric values by means of mathematical formulas as suggested by Kober and Egerer, a different formula will be required for every different reagent used when "1 to 1" (by volume) HCl is employed in prep. the reagent and also for every different density of the standard suspension. In prep. the strychnine molybdate reagent, "the greater the concn. of HCl present when the strychnine sulfate is added, the greater will be the amt. of material pptd. at that time and the greater will be the stability of the reagent. Reagents made up with strong HCl, however, tend to minimize the differences in nephelometric value as between phosphate solns. of different densities; none of the reagents that are serviceable when used in the procedure described by Bloor are entirely stable; they all tend to form a spontaneous ppt. and to reach a state in which they show no difference in nephelometric value as between phosphate suspensions of different densities. The temp. at which the strychnine sulfate is added to the  $\text{Na}_2\text{MoO}_4$ -HCl soln. in making up the reagent may have a considerable effect on its character. In spite of the many disturbing factors, the nephelometric method can be used satisfactorily by taking certain precautions. It is practically an invariable rule (in M.'s experience) that, whatever the relation between difference in density and difference in nephelometric value, less dense solns. read against denser ones in the nephelometer always show a lower nephelometric value. One method, therefore, of escaping from the difficulties which have been described is to have on hand enough of the test soln. for several detns. It is well also to have a series of standard phosphate solns. of graded concns., the range of which should extend from the lower to the upper limit of the range within which the concn. of the test soln. might lie. The test is first read against that standard which is guessed to be nearest to it; and, under ordinary circumstances, this preliminary reading should make it possible to pick out a standard for a second confirmatory reading, whose difference from the test will lie very close to the limits of accuracy attained in any ordinary chem. work. It is necessary, also, however, to test the reagent frequently by using it to read two moderately different standard solns. against each other. For if, as is commonly the case with old reagents and with reagents made up with strong HCl, the differences in nephelometric value are strongly minimized, the experimenter may be deceived in the preliminary test into thinking that the standard and test solns. have nearly equal concns., when this is really not the case at all. In M.'s experience, it has been necessary to test the reagent in the manner described at least every other day. It is obvious that when the detns. are carried out as described above, one is more likely to be deceived by a reagent that minimizes the nephelometric differences than by one that exaggerates them. But reagents which greatly exaggerate the nephelometric differences are likely to be very unstable. Those reagents are likely to be most serviceable which give nephelometric readings about equal to what they should be theoretically. This condition is approx. attained for the Bloor procedure in summer (in the vicinity of Washington) by using a 1:1 HCl which contains 19% HCl by wt. When the temp. is lower, it is advantageous to use a 1:1 HCl which contains from 17 to 18% HCl by wt."

A. P. LOTHROP.

**Notes on Folin's direct nesslerization method for the determination of nitrogen.** LOVELL LANGSTROTH. Univ. Cal. Hosp. *J. Biol. Chem.* 36, 377-80(1918).—On account of the impurity of the  $\text{H}_2\text{SO}_4$  now purchasable as c. p., it is necessary to make a correction for the color modification due to digestion or to digest the standard  $(\text{NH}_4)_2\text{SO}_4$  soln. as follows: Measure 1 cc. of a soln. of purified  $(\text{NH}_4)_2\text{SO}_4$  (containing 1 mg. of N per cc.) with a calibrated Ostwald pipet into a large hard-glass test-tube, add 1 cc. of the acid mixt. of Folin and Denis (*C. A.* 10, 2906) and digest for 2 min. with

a very low flame, placing a watch glass over the top of the tube when  $\text{H}_2\text{SO}_4$  fumes begin to come off. Cool, add distd.  $\text{H}_2\text{O}$ , wash into a flask and set aside until the urine or blood filtrate has been similarly treated. Complete the procedure as directed by Folin and Denis. When metaphosphoric acid is used as the protein precipitant in the detn. of the non-protein N of blood, it is impossible to conc. the soln. when the hard-glass test-tube is held in a vertical position on account of bumping. "If the tube is held just far enough from the horizontal to bring the surface of the liquid half way between the bottom and the mouth of the tube, the microburner flame adjusted so as to be not over  $\frac{3}{4}$  in. high with the tip of the flame 1 cm. from the lowest portion of the tube, and moved away from the center line of the tube toward the edge, as in Fig. 1,

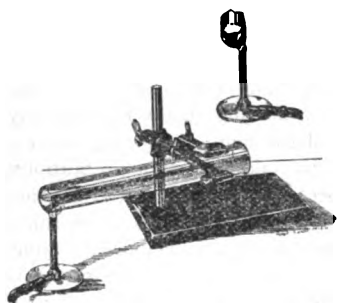


Fig. 1.

the fluid will boil without loss by bumping or foaming. Over 30 min. will usually be required to boil the 10 cc. of filtrate down to 2 cc. but the tube need not be watched more than occasionally. When blackening begins the tube is turned upright and the remainder of the procedure carried out as in the case of urine. At this point, however, the precaution should be taken of placing the tip of the flame well over to one side; otherwise bumping and loss will occur. While keeping it in contact with the tube the flame should at the same time be lowered as far as is consistent with the continued digestion of the blackening filtrate; otherwise there

will be too great a loss of  $\text{H}_2\text{SO}_4$  fumes and a consequent solidification of the material in the tube as digestion is completed. With the greatest care at the end of digestion solidification will sometimes occur and ruin the detn. by making it difficult to wash the material quant. into a flask. This can be prevented by raising the watch crystal slightly on one side and cautiously introducing distd.  $\text{H}_2\text{O}$  with a capillary pipet and rubber nipple drop by drop down the side of the tube as soon as blackening disappears and the soln. clears. Sputtering but no loss of material will occur. The remainder of the procedure is carried out as directed by Folin." With these modifications the method for the detn. of total N of the urine and non-protein N of the blood by direct Nesslerization is accurate and effects a great saving of time and reagents.

A. P. LOTHROP.

**The determination of urobilin in urine.** S. MARCUSSEN and SVEND HANSEN. Rigshospitalet, Univ. Copenhagen. *J. Biol. Chem.* 36, 381-9(1918); cf. *C. A.* 12, 1064.—By the diln. tests described it is possible to est. sufficiently near for clinical use the amt. of urobilin present in the urine of patients suffering from liver complaints. The 10% suspension of  $(\text{AcO})_2\text{Zn}$  in abs. alc. used by Schlesinger is not satisfactory as a coarse, cryst., monoclinic  $(\text{AcO})_2\text{Zn}$  is formed within a few days which is very difficult to shake up and which ppts. quickly. Measure 10 cc. of urine into test-tube A and add 3 drops of a 5% alc. soln. of I (to oxidize any urobilinogen present to urobilin). Shake and measure 1 cc. into test tube B. To test tube A, containing 9 cc. of urine, add 9 cc. of abs. alc. and 1 g. of  $(\text{AcO})_2\text{Zn}$  and, after soln. is complete, filter through a 9 cm. filter paper into a test tube 16 mm. in diam. (diln.  $\frac{1}{2}$ ). If the soln. fluoresces in daylight falling from behind the observer, add to test tube B 3 cc. of  $\text{H}_2\text{O}$ , 1 cc. of a clear 20% aq. soln. of  $(\text{AcO})_2\text{Zn}$ , and 5 cc. of abs. alc. Filter after mixing (diln.  $\frac{1}{10}$ ). If the filtrate fluoresces, measure out 5 cc. of urine and add to it 5 cc. of  $\text{H}_2\text{O}$  and 2 drops of I soln. Transfer 1 cc. of the mixt. to another test-tube (16 mm. diam.), add 3 cc. of  $\text{H}_2\text{O}$ , 1 cc. of 20% aq.  $(\text{AcO})_2\text{Zn}$  soln. and 5 cc. of abs. alc. Mix and filter (diln.  $\frac{1}{20}$ ). If the filtrate fluoresces, measure 5 cc. of urine drop by drop into 15 cc. of  $\text{H}_2\text{O}$

containing 2 drops of I soln. Take 1 cc. of this mixt. and proceed as in the preceding test (diln. 1/40). In a number of patients suffering from liver complaints the fluorescence was detectable in dilns. of 1/40 to 1/80 and in certain cases in even greater diln. In normal patients a fluorescence in a diln. of 1/10 was occasionally observed so that a diln. of 1/20 should be considered as the lowest limit for a pathologically increased urobilinuria. Ammoniacal urines must be acidified with AcOH before making the test. Highly acid urines should be made alk. with  $\text{NH}_4\text{OH}$  and then acidified with AcOH. Further expts. are contemplated "on the importance of the concn. of the urine, the contents of pathological components, the variations in the quantity of the substances usually present, the importance of food, and the consumption of alc." A. P. L.

A method for the identification of certain uramino acids in the presence of amino acids and urea. ALICE ROHDE. Univ. Cal. Med. School. *J. Biol. Chem.* 36, 467-74 (1918).—In the proposed method urea is eliminated from the material under investigation by decomp. it with urease and traces of uramino acids are detected by a special application of the Van Slyke gasometric method for the detn. of amino-N. Treat the fresh urine with Jack bean urease in such proportions as to decompose the urea in 15 min. at 37°, or when possible make the collections directly into enzyme solns. at that temp. Test a portion to make sure that all the urea has been decompd. Neutralize with  $\text{H}_3\text{PO}_4$  and add an excess. Ext. in a liquid extn. app. for 6 or more hrs. with 4-6 vols. of AcOEt. Dist. the AcOEt with steam, clarify the aq. residue with charcoal and conc. on a water bath to small vol. Filter off any crystals of uramino acids which sep. and identify by the m. p. and by amino N detns. before and after treatment with boiling HCl (which forms the anhydrides of the uramino acids which give off no amino N). If no crystals sep. and it is desired to detect traces of uramino acids, continue the concn. until a very small amt. of sirup remains. Add 1-2 cc. of  $\text{H}_2\text{O}$ , make alk. with N NaOH and filter if necessary. Boil for 1 min. to drive off traces of  $\text{NH}_3$  and make up to vol. in a 10 cc. flask. Carry out the Van Slyke method for amino-acid N on 2 cc. samples. Shake second samples for 1 min., allow to stand for 1 hr. in the reaction chamber and shake a second time for 3 min. If more amino N is found in the second sample than in the first, acidify a 5 cc. portion of the material with 10 drops of concd. HCl and boil under a reflux condenser for 1 hr. Make alk., transfer to a 10 cc. flask and make up to vol. Det. the amino N as usual. The difference between the amino N figure before boiling with HCl and that after boiling may be assumed to be amino N from uramino acids.  $\alpha$ -Ureido- $\beta$ -phenylpropionic acid added to cat urine and  $\alpha$ -ureidobutylic acid injected intravenously were recovered by the method. No preformed uramino acid could be demonstrated in the urine of a cat after intravenous injection of 6 g. of *dl*-phenylalanine. A. P. LOTHROP.

A source of error in the use of picric acid in colorimetric estimations in biological fluids. ALICE ROHDE AND MARION SWEENEY. Univ. Cal. Med. School. *J. Biol. Chem.* 36, 475-7 (1918).—"A chromogenic substance other than sugar is present in the blood which certain picric acid fails to ppt. Solid picric acid after purification may undergo a change in its pptg. value for chromogenic substances in the blood. The formation of a deeper color on addition of alk. to picric acid solns. as tested by Folin does not account for the discrepancy of certain picric acids in blood sugar detns. The pptg. value of picric acid must be detd. before reliance may be placed upon color production in quant. procedures for blood sugar." A sample of picric acid which failed to bring about pptn. in the usual way was one which had been purified by the method of Folin and Doisy and kept for 10-12 months in a dark closet in a colorless bottle with a little moisture. A. P. LOTHROP.

A method for the estimation of potassium in blood. S. W. CLAUSEN. Washington Univ. Med. School. *J. Biol. Chem.* 36, 479-84 (1918).—The cobaltic nitrite method

has been adapted to the detn. of K in small amts. of organic materials. The  $K_2NaCo(NO_2)_6$  is heated with dil. NaOH and the nitrites are estd. by titration with dil.  $KMnO_4$  soln. *Reagents.* *Na cobaltic nitrite reagent:* A.  $Co(NO_2)_2$ , 50 g.; glacial AcOH, 25 cc.; distd.  $H_2O$  to 100 cc. B.  $NaNO_2$ , 100 g.; distd.  $H_2O$  to 200 cc. Mix 6 parts of A and 10 parts of B and pass a rapid current of air through the soln. for several hrs. to remove the oxides of N. Keep the dark brown fluid on ice for 2 days and filter off the yellow ppt. which forms on account of the traces of K and  $NH_4$  in the reagents. If kept in a dark bottle in an ice box, the reagent will keep for several weeks.  *$KMnO_4$  soln.:* Dil. 0.1 N  $KMnO_4$  to about 0.02 N and boil under a funnel reflux condenser for 2-3 hrs. After 1-2 days, decant from the Mn oxides and preserve in a cool, dark place. *Standard K solns.:* Standard A, 1 cc. = 10 mg. K. KCl, 9.546 g.; concd. HCl, 1 cc.;  $H_2O$  to 500 cc. Standard B, 2 cc. = 1 mg. K. Standard A, 25 cc.; concd. HCl, 1 cc.;  $H_2O$  to 500 cc. The KCl should be recrystd. several times and then fused; the HCl is added to prevent the growth of molds. *Estn. of K in pure solns.:* Measure an amt. of soln. which contains 0.2 to 2.5 mg. of K into a 50 cc. beaker and evap. almost to dryness on a water bath. Add 2-3 drops of glacial AcOH and 1 cc. of the Na cobaltic nitrite reagent. Evap. until the mixt. becomes sirupy, taking care not to carry the evapn. too far which results in the formation of insol. brown compds. giving too high results. Cool and add 4-5 cc. of  $H_2O$ . Prepare a Gooch crucible having a fairly thick asbestos mat (filter paper must not be used) and just before the mat is sucked dry pour on a suspension of  $BaSO_4$  which serves to fill up the larger pores and also as an excellent test for the mat. Before the  $H_2O$  has all passed through, pour on the contents of the beaker containing the ppt. Rinse the beaker with 4-5 cc. of cold  $H_2O$  and repeat the washing 6 times with 2-3 cc. portions of  $H_2O$ . When the mat is almost dry, transfer it to the beaker and wash all adhering particles from the crucible to the beaker with 9-10 cc. of  $H_2O$ . Add 1 cc. of 10% NaOH soln., heat to boiling, then cool. Make up the dark brown mixt. to exactly 25 cc. and centrifuge. Pipet off 20 cc. into a 150 cc. Erlenmeyer flask, add 5 cc. of 1:4  $H_2SO_4$ , and titrate with 0.02 N  $KMnO_4$  soln. Run in the  $KMnO_4$  until a faint pink color persists for  $\frac{1}{2}$  min. Warm the flask on an elec. plate and add more  $KMnO_4$  slowly until the color persists for  $\frac{1}{2}$  min. at about  $70^\circ$ . Blanks are usually small, 0.05 to 0.1 cc. The K value of the  $KMnO_4$  soln. is detd. by analysis of standard soln. B and this value should be detd. frequently. *Calcns.* are based on the values thus obtained rather than on a theoretical factor. *Estn. of K in blood:* Digest 2 cc. of plasma or 1 cc. of blood with 5 cc. of a mixt. of 1 part of  $H_2SO_4$  and 20 parts of  $HNO_3$  in a  $200 \times 25$  mm. Pyrex glass tube. Arrange a fume absorber and heat slowly with a micro-burner for about  $\frac{1}{2}$  hr. A short piece of Pt wire sealed through the bottom of the tube, serving as a heat-conductor and boiling focus, is useful in preventing foaming and bumping. After  $\frac{1}{2}$  hr. evap. off the excess of  $HNO_3$  rapidly. The remaining drop of  $H_2SO_4$  will darken considerably. Remove the flame and allow the small amt. of  $HNO_3$  condensed on the walls of the tube to run back. If the soln. does not clear, add 2-3 drops of  $HNO_3$  and boil until the acid is colorless. Cool, wash into a 50 cc. beaker, make alk. to phenolsulfonethalein with 10% NaOH and evap. to dryness on a water bath. Add glacial AcOH (a few drops) until the mixt. is acid, then 1 cc. of cobaltic nitrite reagent and evap. until crystals of  $Na_2SO_4$  appear. Cool. Complete the detn. as already described for pure solns. All reagents must be tested for the presence of K. A sample of NaOH purified by alc. was found to contain as much as 0.05% of K. The Na citrate used to prevent clotting of the blood must also be examd. for K. A few results obtained with plasma and whole blood in a variety of pathological conditions are given.

A. P. LOTHROP.

Conductivity as a measure of permeability. W. J. V. OSTERHOUT. Harvard Univ. *J. Biol. Chem.* 36, 485-7(1918).—O. has used the method of measuring the



permeability of protoplasm by detg. the elec. conductivity of the tissues. A considerable part of the current must flow through the non-living intercellular substances by which the masses of protoplasm are sepd. in the tissue, and O. has investigated the question as to whether any of the current passes through the living protoplasm. Expts. made with a green marine alga (*Ulva*) and a marine flowering plant (*Zostera*), plants whose intercellular substance consists of cellulose, in which the protoplasm was killed by means which are known to produce no irreversible changes in the properties of cellulose, indicate "that the alterations of conductivity observed in living tissue are due to changes in the protoplasm and not to changes in the non-living intercellular substance." The protoplasm was killed by various means such as partial drying, treatment for a few hrs. with 25% alc., exposure for a few min. to sea water at 40° and placing for several hrs. in a soln. of NaCl of the same conductivity as the sea water, and in all cases the conductivity rose to a const. value (indicating death) and was not thereafter affected by exposure to reagents which produce great alterations in the conductivity of living tissue. The temp. coefficient of the elec. conductivity of living tissue differs from that of dead tissue which could not be the case if the living protoplasm did not conduct part of the current. The results obtained by the elec. method are in complete agreement with those obtained by other methods of measuring permeability, such as that of tissue tension, plasmolysis, exosmosis and diffusion through membranes of living tissue. "It is, however, more accurate as well as more convenient. It enables one to make detns. at much shorter intervals than other methods. This not only permits the detection of rapid changes in permeability which would otherwise escape observation, but enables one to det. with precision the time curve, which is indispensable in the study of dynamics."

A. P. LOTHROP.

A method of measuring the electrical conductivity of living tissues. W. J. V. OSTERHOUT. Harvard Univ. *J. Biol. Chem.* 36, 557-68(1918).—A method is described for measuring the elec. conductivity of living organisms which can be applied to pieces of tissue or to intact organisms. The material is placed between two electrodes and its elec. resistance measured by means of a Wheatstone bridge. Measurements made by the method do not vary more than 1% from the mean under the most favorable circumstances. The original must be consulted for the description of the app. and the details of the technic.

A. P. LOTHROP.

A quantitative study of the evaporation of blood serum. GEORGE H. BURROWS AND EDWIN J. COHN. Harvard Univ. and Med. Dept., U. S. Army. *J. Biol. Chem.* 36, 587-90(1918).—"A need for the dried solids of blood serum in immediately sol. form has led to a study of methods of low temp. evapn. of protein solns. The method adopted may be used in other instances." Freshly collected blood is allowed to clot undisturbed in cylindrical vessels of several gallons cap. The strands of the clot are sepd. from the sides with a thin knife blade and then the serum is syphoned into bottles and centrifuged to remove the remaining corpuscles. Laking of the blood is thus rendered unnecessary and a perfectly clear, amber-colored liquid is obtained. The liquid is evapd. in an ordinary distg. flask of a cap. of at least 1 l. which is provided with 100 g. of rather large glass pearls. The flask is weighed when quant. data are desired. It is then immersed to about the level of the side tube in H<sub>2</sub>O of the desired temp. (usually not above 50°). A dropping funnel is introduced into the flask with the end of the stem extending well into the bulb. The side tube is connected with an efficient condenser, arranged vertically and emptying into a previously weighed bottle of a size suitable for trapping the evapd. and recondensed H<sub>2</sub>O. After this follows in succession a small, weighed CaCl<sub>2</sub> tower, a manometer and a vacuum pump. The trap bottle and CaCl<sub>2</sub> tower are immersed in ice water which also flows through the condenser jacket. The app. is evacuated to a pressure of 1 cm. or less of Hg and a weighed amt. of serum is

allowed to enter slowly through the dropping funnel at a rate as nearly as possible equal to the rate of evapn. The serum foams vigorously and leaves a friable product adhering loosely to the walls of the flask. When the desired amt. of liquid has evapd., the cold  $H_2O$  in the condenser is replaced with warm and the air is slowly admitted through the funnel after which the flask is again evacuated. The temp. of the bath is raised somewhat as the evapn. nears completion. When the serum is dry, the app. is dismantled and the parts previously weighed are dried and reweighed. The glass pearls will loosen and pulverize the product if the flask is given a vigorous rotary motion and are sepd. from the product by pouring onto a sieve of proper mesh. Very accurate results can be obtained. The solids of the serum examd. constituted 8.93% of the whole. The powdered product was light yellow in color and had a faint odor. It contained 11.75% of N and dissolved readily in distd.  $H_2O$ , giving a very slightly turbid soln. The trapped  $H_2O$  from the evapn. was clear and colorless and was nearly free of electrolytes as it had a sp. conductance of approx.  $7.7 \times 10^{-5}$ . It had a slight odor of  $NH_3$  and was faintly alk., having a  $p_H$  of 8.1. The  $p_H$  of the original serum, which had not been adjusted to a particular  $CO_2$  tension, was 7.65 and its conductance  $1.22 \times 10^{-2}$ . Redissolved in  $CO_2$ -free  $H_2O$  in its original concn., the reaction of the prepn. was  $p_H$  9.4. The isoelec. point of serum albumin appears at about  $p_H$  4.7 and if serum is treated with approx. 0.06 cc. of  $N$  HCl per 1 cc., giving a  $p_H$  of 4.5, and then evapd., the product obtained is more friable and less sol. in  $H_2O$  than that from the untreated serum. Such a prepn. is presumably near the isoelec. point of the proteins and dissolves readily on the addition of acid or of alk. A prepn. prepared from serum treated with less acid than the above requirement ( $p_H$  5.3) was more easily sol. in  $H_2O$  than that from serum evapd. at its isoelec. point and less alk. than that from unacidified serum. The carbonates of the serum can thus be conveniently transformed into chlorides or into the salts of other acids.

A. P. LOTHEROP.

**New method for detection of methylene blue in urine and approximate determination of the amount of this substance eliminated in twenty-four hours.** C. BOTELHO. *Compt. rend. soc. biol.* 81, 291-3(1918).—This method is based on the adsorption of certain dissolved pigments by collodion films immersed in a soln. of the same. The method may be used as a qual. test by adding AcOH to the urine, heating to boiling (to transform chromogen, if present), immersing the films in the urine and withdrawing the latter after about 10 min.; the color is made more apparent by superimposing the films and very small amts. of methylene blue may thus be rendered distinctly visible. This method is more sensitive than the usual  $CHCl_3$  method and is fully as sensitive as the thymol procedure (recently described by Tribondeau). An approx. quant. detn. may be made in the following manner in cases where renal permeability is to be tested: A no. of collodion films of standard dimensions is prepared by pouring 5 cc. of recently prepd. officinal collodion on each of a no. of  $9 \times 12$  cm. glass slides so as completely to cover the latter with a layer of collodion of approx. uniform thickness. After evapn. is complete the films are detached and used as needed or kept in  $H_2O$  until required. One-fifteenth of the total 24 hrs. urine is heated to boiling after addition of AcOH,  $1/2$  of a film is introduced and the boiling is continued 10 min.; if all the methylene blue is not adsorbed another  $1/2$  of a film is introduced and the procedure is repeated. Expts. with pathol. urines and various solns. of methylene blue of different concns. showed that a collodion film of given dimensions adsorbs a practically const. amt. of methylene blue and that thirty  $9 \times 12$  cm. films are required in order to adsorb 25 mg. of this substance, this being the amt. usually eliminated by normal kidneys during a 24-hr. period following intramuscular injection of 50 mg. of methylene blue. Two films are, therefore, required in order to adsorb all the methylene blue eliminated under these conditions in  $1/18$  of the total 24 hrs. urine. In cases of imperfect renal perme-

ability the approx. proportion of the normal amt. of methylene blue which is eliminated in a 24-hr. period may be detd. by successively adding  $\frac{1}{2}$  of a film, as indicated above, until all of the dye is adsorbed.

H. S. PAINE.

**Determination of the nuclein content of yeast.** C. A. LUBSEN. Amsterdam. *Pharm. Weekblad* 55, 1625-8(1918).—Expts. were made to find whether nucleins are completely pptd. by digestion with pepsin HCl in solns. containing more than 0.1% of HCl. It has been contended that part of the nuclein remains in soln. owing to formation of nucleic acid, which is sol. in acid soln. But the results obtained lead to the conclusion that nucleic acid formation does not take place under the conditions of analysis, and that the detns. are, therefore, reliable.

JULIAN F. SMITH.

The determination of carbon dioxide in carbonates (VAN SLYKE) 7.

BANG, IVAR: *Lehrbuch der Harnanalyse*. Wiesbaden: Verlag von J. F. Bergmann. 151 pp. M 7.60. For review see *Chem. Weekblad* 15, 1575(1918).

BARD, M. L.: *Précis des examens de laboratoire employés en clinique*. 3rd Ed. Revized and corrected. Paris: Masson et Cie. 836 pp. 16 francs 80. For review see *Rev. sci.* 56, 571(1918).

TODD, JAMES CAMPBELL: *Clinical Diagnosis: A Manual of Laboratory Methods*. 4th Ed. Philadelphia: W. B. Saunders Co. 687 pp. \$3 net. For review see *J. Am. Med. Assoc.* 71, 1512(1918).

### C. BACTERIOLOGY.

The effect of concentrated solutions of certain magnesium salts on pyrogenic and other bacteria. ZAE NORTHRUP. Mich. Agr. College, East Lansing. *J. Infect. Dis.* 24, 170-6(1919).—The purpose of this paper is to explain the rationale of the use of a concd. soln. of  $MgSO_4$  in cosmetics for the removal of pimples from the face. The beneficial effect of this soln. is shown not to be due to any bactericidal action on *Staphylococcus aureus*. *Streptococcus* skin infections, however, may be inhibited if any concn. of  $MgSO_4$  be used externally.  $MgCl_2$  had a most marked inhibitory action on the growth of all organisms experimented with (*Staph. aureus*, *B. coli*, *B. typhosus*, *Ps. pyocyaneus*), which suggests that it may be substituted for  $MgSO_4$  under certain conditions.

JULIAN H. LEWIS.

Elaboration of silica and calcium silicates by algae of the *Girvanella* group (LAPARENT) 8. A biochemical theory of the origin of indianaite (LOGAN) 8.

BROWNING, C. H.: *Applied Bacteriology*. London: H. Frowde & Hodder & Stroughton. 291 pp. 7s. 6d net.

LIPMAN, JACOB G.: *Bacteria in Relation to Country Life*. Reissue. New York: The Macmillan Co. \$1.50.

### D. BOTANY.

CARL L. ALSBERG.

Catalase and oxidase content of seeds in relation to their dormancy, age, vitality and respiration. WILLIAM CROCKER AND GEORGE T. HARRINGTON. Bur. Plant Industry, U. S. Dept. Agr. *J. Agr. Research* 15, 137-75(1918).—By the method of Appleman (C. A. 5, 897) measurements were made of the catalase activity of the seeds of Johnson grass, Sudan grass and *Amaranthus reflexus* under varying conditions of drying, age, heating, retention in a germinator and germination. Measurements were also made of the catalase activity of the different parts of the seed in the above-mentioned plants and also in wheat, Tunis grass, sorghum and peach seeds. The oxidase activity was also measured for a number of the above-mentioned plants by the method of Bunzell (C. A. 6, 2445). In detg. the catalase activity it was found that the  $H_2O_2$  used should be neutral, as acidity in this reagent greatly inhibits the catalase activity. Excess

pulverization also reduced the catalase activity. The powdered seed of Johnson grass stored in a desiccator lost 70% of its activity in 54 days while the intact seeds do not show this rapid loss. In all cases the catalase activity of the embryo was many times that of the endosperm while the physiologically inactive organs showed much lower catalase activity than the seeds. Immature seeds showed a greater catalase activity than the mature seeds. With the exception of the seeds of basswood, seeds which were dried after storage in the germinator showed a great decrease in catalase activity. In relation to storage and heat, the seeds of Johnson grass were labile while the seeds of *Amaranthus* were stable. The seeds which have a period of "after-ripening" showed a marked rise in catalase activity when retained in the germinator imbibed, while under similar conditions the seeds of Johnson grass lost 66% of their catalase activity in 1 year and showed a smaller decrease in their oxidase activity. During germination the catalase activity of grass seeds rose rapidly with no change in oxidase content. Johnson grass seeds exhibited a relationship between catalase activity and respiratory intensity.

R. N. HARGER.

General introduction to the study of the physiological function of the latex in *Hevea brasiliensis*. W. BOBILIOFF. *Arch. v. d. Rubbercultuur* 2, 281-313; *Chem. Weekblad* 15, 1393-4(1918).—The theories which have been advanced to explain the function of the latex in rubber-producing plants are reviewed. None of these have been thoroughly established. The theories that it is a plant food, a water reservoir or an absorbent for O are more probable than that it is a food carrier or a simple secretion. The conclusion reached is that the latex performs more than one function.

JULIAN F. SMITH.

The behavior of some organic compounds in plants. X. G. CIAMICIAN AND C. RAVENNA. Bologna. *Gazz. chim. ital.* 48, I, 253-304(1918).—The expts. described in preceding papers (C. A. 12, 1307, 1308) are continued in this. The paper is divided into 3 parts. *Part I. The action of some compds. on the germination and the development of the plant:* The earlier expts. on the effect of various org. compds. on kidney beans germinated and grown on absorbent cotton were extended. Many other substances and some other plants have now been used. From the expts. which are fully described it is clear that some aromatic substances like benzyl and salicyl alcs., benzoic and salicylic acids, vanillin and tannin are supported quite well by the plants of kidney beans, without causing notable changes in their exterior form. Eugenol and essence of mustard are, however, quite poisonous as was foreseen; mandelic nitrile is less poisonous and produces a characteristic change in the habit of the plant, which, however, does not persist. More interesting results were obtained with the alkaloids, and above all with nicotine, by experimenting on kidney beans with 1 part per 1000 solns. of the resp. tartrates. All the vegetable alkaloids properly examd. exercise a poisonous action on the plants, while pyridine and piperidine produce only a darker color in the leaves, not affecting growth and development. The comparison of the behavior of caffeine, xanthine and uric acid is interesting. The 1st is a distinct poison for kidney bean plants while with xanthine and uric acid used as K salts there is a normal sturdy growth without any injury. Caffeine is trimethylxanthine. Thus the presence of Me groups gives rise to an intense physiological action which the parent compd. does not have. It has been held by some that the alkaloids are useless org. excrement and that the Me group so frequently encountered in plant products ought to be considered as a protective agent to damp the too reactive groups like hydroxyl and imino groups. These expts. reverse this view. A further study of the behavior of org. compds. and their alkyl derivs. with plants appears to be promising. Among the alkaloids tested the least poisonous for the kidney bean plant is morphine, which has remarkably slight toxic effects; this is followed by quinine which causes the base of the stem to wither after which

the plant bends and dies; then strychnine which at first shows a favorable action, but presently causes the leaves to fall by which the plant perishes. The antagonistic action between strychnine and mandelic nitrile is remarkable. It was observed before with germinating seeds and now with plants that the plant lives longer when subjected to a mixt. of the two than in the presence of either of the two. Nicotine has a strongly toxic action on kidney bean plants grown in glass which it kills in a few days. C. and R. briefly discuss the idea that alkaloids may function in plants like vegetable hormones and suggest that simple compds. like pyridine may be used to produce the more complex alkaloids just as tyrosine is utilized to produce adrenaline in the suprarenal gland. The results are summarized in tables. *Part II. Autooxidation:* The earlier expts. on this subject have been extended to other compds. in the presence of air and  $\text{CO}_2$ . The results are summarized in tables. The main conclusion, on the basis of the comparative tests in the air and in  $\text{CO}_2$ , is that the disappearance of certain compds. in an atm. of  $\text{O}_2$  in the presence of the enzymes of spinach leaves is really due to a process of oxidation. Saligenin in a  $\text{CO}_2$  atm. is converted into a polyanhydride salyretin and this transformation takes place more quickly with spinach hash than with that from apples (mele). EtOH and mannitol are not appreciably oxidized and are likewise not autooxidizable by light. It is remarkable that acetaldehyde, which is little autooxidizable in an atm. of  $\text{O}_2$ , is not changed appreciably by these org. catalysts, while acetone, which is autooxidizable in light, is oxidized in the presence of the enzymes to formic and acetic acids. Of the 3 amino acids used glycol, alanine and asparagine only the last is oxidized in air, while it remains unchanged in an atm. of  $\text{CO}_2$ . Cinnamic acid is not oxidized at the double bond as one might suspect, but remains mostly unchanged; a trace only is transformed into the isomer isocinnamic acid. It is curious that this isomerization does not take place in an atm. of  $\text{CO}_2$ . Of the alkaloids tested caffeine and strychnine remain unchanged, while morphine, quinine and cinchonine are largely oxidized. The enzymes in spinach leaves also bring about other reactions; thus glucose in air is largely oxidized; but in a  $\text{CO}_2$  atm. a considerable amt. of a substance that gives glucose on hydrolysis is formed. Both in air and  $\text{CO}_2$  tartaric acid gives a complex which is hydrolyzed by emulsin to give tartaric acid. Since salicylic acid and saligenin are not autooxidized in the light it will be useful to compare in further expts. the catalytic action with light with that of plant enzymes in oxidations. *Part III. Elimination of certain compds. from the aerial organs of plants:* In some preceding work it was found that some compds. that remain unchanged in contact with spinach hash in a current of  $\text{O}_2$  disappear largely when inoculated into the living plant. This was observed with pyridine and nicotine. This difference in behavior might be due to a greater power of oxidation of the living plant in comparison with ground leaves, but since in this case volatile compds. are involved the elimination of these alkaloids through the leaves is not excluded. In order to test this, some expts. on the inoculation of corn with these 2 compds. were carried out. The expts. showed that pyridine thus administered is largely eliminated from the leaves. The aerial part of the plant was placed in a closed flask fitted with 0.5%  $\text{H}_2\text{SO}_4$  to catch the pyridine. The recovery was not quant. so that it is possible that the plant oxidizes or transforms otherwise some of the pyridine administered. Similar results were obtained with nicotine. E. J. WITZEMANN.

BUTLER, E. J.: *Fungi and Disease in Plants*. Calcutta: Thacker, Spink & Co. Ra. 15. For review see *Agr. J. India* 13, 666.

Mechanism of the assimilation process (SCHAUM) 10.

#### E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Metabolism of glucose in surviving organs. V. Action of the renal tissue of

the fed or fasting dog on glucose circulating therein. U. LOMBROSO. Univ. Rome. *Arch. farm. sper.* 25, 12-6(1918); cf. *C. A.* 12, 1309.—Blood or Ringer soln. containing glucose, when circulated through the isolated kidney, undergoes an appreciable loss of glucose. With kidneys from fasting dogs the diminution is less than with kidneys from fed dogs. VI. Influence of fasting on the ability of the intestine to consume glucose circulating therein. CARLO LUCHETTI. *Ibid* 57-64.—Glucose dissolved in Tyrode solution or blood and circulated in the intestinal tissue of the fed dog diminishes 50% or more. Part is destroyed and part is deposited as glycogen. Similarly with intestinal tissue from the fasting dog there is a diminution of glucose but to a smaller extent. Fasting does not, however, influence the glycolytic power of the intestine to the extent that it does in the liver and kidney. A. W. DOX.

Net energy values of alfalfa hay and of starch. HENRY P. ARMSBY AND J. AUGUST FRIES. Penn. Agr. Expt. Sta. *J. Agr. Research* 15, 269-86(1918); cf. *C. A.* 12, 2211.—Seven respiration calorimeter expts. were carried out with a steer to det. the digestibility and metabolizable energy of different amts. of alfalfa hay and of a mixt. of alfalfa hay and starch. The digestibility of the ration, the losses in the urine and the extent of methane fermentation increased as the total amt. of ration was decreased, and the greater loss of energy in urine and methane more than compensated for the smaller losses in feces so that the total metabolizable energy was less on light rations. The metabolizable energy of starch was 10% greater than found by Kellner (*Land. Vers. Sta.* 53, 474(1900)) and the av. heat increment from starch was 1.692 cal. per kg. as against 1.248 as found by Kellner; while the av. heat increase for alfalfa hay was 999 cal. per kg. R. N. HARGER.

Three year tests for the comparison of a relatively high with a relatively low protein ration with dairy cattle ("Frühjahrskalbinnen") in the stall. J. J. OTT DE VRIES. *Vereeniging tot exploitatie eener proefzuivelboerderij te Hoorn Jahresbericht* 1916, p. 15; *Biedermanns Zentr.* 47, 165-9(1918).—A relatively considerable diminution (20 to 30%) of the protein ration with reference to the av. norms of Kellner gave no distinctly noteworthy decrease in the output of "Frühjahrskalbinnen" in the fall, caused only a small decrease in the yield of milk as well as of the most important constituents of the milk of freshly calved cows and showed also subsequently no distinct decrease of yields during the first month of pasturage upon the meadow. During the spring stall-period those cows which received more protein gave increases of protein in their milk of less than 10% of the increased protein in their food. ALBERT R. MERZ.

The large-scale development of swine fattening in Hungary. K. EREKY. Buda-pest. *Mitt. Deut. Landw. Ges.* 32, 541-50(1917); *Biedermanns Zentr.* 47, 180-8(1918).—A description is given of a large establishment for fattening swine and of the problems involved in the improvement of the business. The swine is compared to a machine converting feed into bacon. The efficiency of the bacon-producing organism is 37%. The increase of this efficiency is a scientifically and practically important goal. The formation of fat from dextrose is formulated thus:  $13\text{C}_6\text{H}_{12}\text{O}_6 = \text{C}_{56}\text{H}_{104}\text{O}_6 + 23\text{CO}_2 + 26\text{H}_2\text{O}$ , so that theoretically 270 parts of sugar give 100 parts fat. Actually only a 100 kg. increase in live wt. is obtained from 400 kg. sugar. Fat formation does not always take place in the same way. Fatty acids are often formed from the starch through bacterial activity. These are more easily converted into fat than the dextrose. E. believes that well fed swine live in symbiosis with the bacteria which convert starch into fatty acids. Amino-acids play a leading role as transition stages in the protein-formation of the swine. A table is shown giving the various amino-acid decomposition products of plant proteins. Some of these amino-acids are indispensable while others are not necessary for the swine. Supplementing the food with inorg. salts is also necessary. Analyses are given of the ash of corn and barley. The pre-

dominant potash content causes a lack of Na in the blood and it is necessary to supply the swine with NaCl. The physiological action of Ca is emphasized. Whether a swine is of peaceful or restless temperament depends upon the relation between the secretions of various glands to the blood and fat production is in turn dependent on this. The internal secretions apparently are derived from the amino-acids of proteins. The carboxyl-group of the acids is split off in the glands and the so-called "proteinogenen" amines are formed (Abelin, Über proteinogene Amine, *Naturwissenschaften* 1917, No. 12).

ALBERT R. MERZ.

Feeding experiments with raw and boiled carrots. MINNA C. DENTON and EMMA KOHMAN. Univ. Chicago. *J. Biol. Chem.* 36, 249-63 (1918).—"It has often been urged that some of the common root vegetables should be used as extensively as may be practicable, as partial substitutes for the cereals, as supplements to them in certain respects, and certainly as supplements to the vegetable oils. A knowledge of the dietetic properties of these root vegetables is then of importance, particularly so since the use of dehydrated vegetables promises to come into general vogue." Carrot in the dry form furnishes almost as large a proportion of N cals. as compared with total cals. as does corn meal and is then equiv. to the latter quant. Feeding expts. with albino rats have been performed to det. whether carrots are also qual. sufficient for growth and well-being. The nutritive value of carrots when used as part of a mixed diet is not perceptibly injured by the ordinary methods of cooking. Much of the cal. value is, however, lost when the H<sub>2</sub>O used in the cooking is not added to the food. On a diet properly supplemented with starch, purified com. casein, butter or lard, and salts to such an extent that 50% of the cal. value of the diet is furnished by carrots, normal growth and reproduction occur in albino rats. Animals may be supported in good health for as long as 16 weeks on an exclusive diet of carrots except for the addition of Ca, P, Na and Cl; there is no growth on this diet but an increase in body wt. may occur. Results on this exclusive carrot diet are inconstant on account of the great variation in the nutritive value of different lots of carrots and in the vitality of different animals. Considerable amts. of both H<sub>2</sub>O-sol. and fat-sol. vitamins are present in carrots. When the proportion of N is reduced by the addition of fat or starch, dropsy occurs in a large % of the rats fed on a carrot diet. "War dropsy," which has appeared among the victims of malnutrition during the war, has been generally ascribed to a lack of fat but D. and K. are inclined "to attach at least equal if not greater importance to the protein or N content of the diet." Further work on this problem is in progress.

A. P. LOTHROP.

The synthetic capacity of the mammary gland. I. Can this gland synthesize lysine? E. B. HART, V. E. NELSON AND W. FITZ. Univ. Wis. *J. Biol. Chem.* 36, 291-307 (1918).—"The mammary gland manufactures "a special protein, casein, and presumably from amino-acid fragments in the blood. It is also presumed that it makes casein, not through synthesis of amino-acids *de novo*, but by an orderly assembling, in quant. relations, of those amino-acids found in the casein mol. Should an amino-acid, occurring in casein and essential for growth, be absent in the diet, would there be a serious interference in casein building, or does this gland retain special synthetic powers not shown by muscle cells, and in the absence of a sp. amino-acid make it from other nitrogenous fragments?" In investigating the cap. of the mammary gland to synthesize the lysine necessary for the production of casein, vigorous female rats were fed on zein diets made complete by properly supplementing with a complete salt mixt., vitamins and tryptophan and in some expts. arginine and histidine. The effect of this diet was compared with the effect of the same diet to which lysine had been added in amt. to form 1% of the diet. Those animals on a lysine-free diet were invariably unable to rear their young although a number of animals

gave birth to apparently normal litters, indicating that the other was able to build her young presumably from tissue reserves rather than through synthesis of lysine. In only a single instance was a litter nursed sufficiently to carry it beyond a mere maintenance of life for approx. 2 weeks. What milk was secreted was undoubtedly normal rat's milk, the lysine contained in the milk proteins made being furnished through tissue catabolism. When lysine was added to the supplemented zein diet not only were normal litters of young born but in most instances the young were successfully nursed. There was not a normal rate of growth but the condition of the mother and young was healthy; the probable cause of the failure of the young to grow at a normal rate was the incomplete absorption of the zein in the ration. Normal growth occurred when casein was substituted for the supplemented zein-lysine combination in the diet. When additions of arginine and histidine were made to the zein-lysine ration, the rate of growth was no greater; apparently the indigestibility of the zein counteracted any beneficial effect those two amino-acids might have been expected to have when added to a protein relatively low in them. In a majority of cases the animals did not even maintain their live wt. on the lysine-free diet and showed evidences of malnutrition such as rough and soiled coats and a nervous and excitable condition. In the opinion of the authors "normal maintenance is not possible in the absence of the amino-acid, lysine." In previous expts. where conclusions were drawn from records of maintenance of live wt., "there certainly is the possibility that catabolizing non-essential tissues can furnish over very long periods of time enough lysine for rehabilitation of those tissues more essential for the maintenance of life. The maintenance of live wt. may be either a replacement of loss with  $H_2O$  or with fat. Milk secretion, like growth, is ultimately dependent upon the quality and quantity of amino-acids ingested with the food."

A. P. LOTHEOP.

**Animal calorimetry. XV. Further experiments relative to the cause of the specific dynamic action of protein.** H. V. ATKINSON AND GRAHAM LUSK. Cornell Univ. Med. College. *J. Biol. Chem.* 36, 415-27(1918); cf. *C. A.* 6, 3432; 7, 107, 108, 363, 364, 1041; 8, 2563; 9, 1630, 2926; 12, 285, 1999.—The validity of L.'s conclusions that the sp. dynamic action of protein is due to the action of the metabolites ( $\alpha$ -hydroxy- and  $\alpha$ -keto-acids) of certain of the amino acids in the protein (*C. A.* 9, 1631) and that the process of deamination or of urea formation plays no role in the increased heat production has been further investigated with the following results: The administration of 200 cc. of 0.4% HCl may cause a slight increase of 6% in the basal metabolism of a dog but the simultaneous administration of 10 g. of aspartic acid causes no further increase. "The expts. with aspartic acid corroborate the former work with glutamic acid and indicate that the 2 dibasic acids occurring in protein exert no sp. dynamic action upon metabolism. Asparagine and glycocoll, which contain the same % of N behave very differently in metabolism, the 1st being without sp. dynamic action and the other exerting the most powerful sp. dynamic action of any of the amino-acids contained in protein which have thus far been tested. Therefore, the sp. dynamic action of protein is not due to the  $NH_2$  radical of the amino-acid mol. Succinic acid (a possible intermediary metabolite of glutamic acid) is without power to increase the heat production, which accords with the previously detd. behavior of glutamic acid. Acetamide (a chem. isomer of glycocoll) is not deaminized by the dog nor does it increase the heat production of the animal. The conclusion formerly expressed that the processes of deamination and urea formation have nothing to do with the sp. dynamic action of protein is upheld by these later researches." The expts. wholly fail to substantiate Grafe's conclusions (*Deut. arch. klin. Med.* 118, 1) that the sp. dynamic action of protein is largely due to the liberation of the  $NH_2$  radical of amino-acids.

A. P. LOTHEOP.



Urinary excretion of phosphates in the rabbit. FRANK P. UNDERHILL AND L. JEAN BOSSERT. Yale Med. School. *J. Biol. Chem.* 36, 521-30(1918).—The expts. were undertaken to study "the relative proportions of P of the food intake excreted in the urine when the diet varied from acid-producing food, such as grain, to base-producing food, like carrots; to note the effect of subcutaneous injections of phosphates on the urinary P of the rabbit; and to observe the influence of diets consisting of acid-producing or base-producing foods and of injections of mono-, di-, and tribasic phosphates upon the relative proportion of injected P excreted in the urine. Rabbits, in contrast to most other herbivora, excrete a considerable amt. of phosphates through the kidneys. The proportion of food P eliminated in the urine by rabbits may be caused to vary widely by changes in the nature of the diet, being about 25% on a carrot diet, 50% on a mixed diet of carrots and oats, and over 100% on a diet composed exclusively of oats. Solns. of  $\text{NaH}_2\text{PO}_4$ ,  $\text{Na}_2\text{HPO}_4$  and  $\text{Na}_3\text{PO}_4$  injected subcutaneously each caused a considerable increase in urinary phosphates, 70 to 100% of the injected P having frequently appeared in the urine. After successive subcutaneous injections of phosphate, less of the injected P is excreted in the urine than after the initial injection. The character of the diet and the nature of the phosphate injected had no apparent influence on the % of injected P excreted by the kidneys. It is impossible, however, to draw general conclusions with regard to these factors on the basis of these expts., due to variations in urinary P excretion in individual rabbits and to the effect of repeated injections of phosphate solns. on the urinary elimination of phosphates subsequently injected. Large increases in the phosphate content of the urine were noted accompanied by only slight increases in H ion concn." A. P. LOTHROP.

Vitamine studies. II. Does water-soluble vitamine function as a catalase activator? R. ADAMS DUTCHER AND FERDINAND A. COLLATZ. Minn. Agr. Expt. Sta. *J. Biol. Chem.* 36, 547-50(1918); cf. *C. A.* 12, 2613.—D. has recently shown (*C. A.* 12, 2613) that an apparent relationship exists between oxidative processes and vitamine storage in avian polyneuritis inasmuch as the tissues of polyneuritic pigeons are low in catalase content and feeding  $\text{H}_2\text{O}$ -sol. vitamine brings about normal catalase content accompanied by improvement in the condition of the birds. Expts. have been made to det. whether vitamine exts. possess the property of directly activating catalase or of bringing about a greater production of the enzyme. "The results indicate that  $\text{H}_2\text{O}$ -sol. B does not act as a direct activator of catalase, but instead probably (on account of its physiological properties) stimulates the organism to greater production of catalase." III. Observations on the curative properties of honey, nectar, and corn pollen in avian polyneuritis. *Ibid* 551-5.—The expts. were undertaken to prove or disprove the presence of vitamins in honey on account of statements in the affirmative which have been made in popular articles and because the consumption of larger amts. of sirups and honey has been encouraged in order to conserve the supplies of cane and beet sugar. As honey is high in  $\text{H}_2\text{O}$ -sol. substances and low in fatty materials, a search was made for the  $\text{H}_2\text{O}$ -sol. vitamine rather than its fat-sol. prototype. "Honey contains a small amt. of  $\text{H}_2\text{O}$ -sol. vitamine but the amt. is negligible. It is probable that the slight antineuritic properties of honey are overbalanced by the large amt. of carbohydrate present, for the presence of vitamins was made evident only by adsorbing the vitamins upon siliceous earth (Lloyd's reagent). There was very little evidence of the presence of  $\text{H}_2\text{O}$ -sol. vitamine in the dil. unevapd. nectar. Corn pollen is relatively rich in  $\text{H}_2\text{O}$ -sol. vitamine and it is possible that the small amt. of this in honey may have its origin in the pollen of flowering plants, either in the form of pollen grains adventitiously present, or in the digested products, which might be introduced by the salivary juices of the bee." A. P. LOTHROP.

**The effect of the material ingestion of desiccated placenta upon the rate of growth of breast-fed infants.** FREDERICK S. HAMMETT. Harvard Univ. *J. Biol. Chem.* 36, 569-73(1918); cf. *C. A.* 12, 167.—The expts. were designed to "det. definitely whether placenta tissue *per se*, when fed to nursing mothers, contains a substance or substances affecting the rate of growth of the breast-fed infants, it being a well-known fact that milk may contain as such, or slightly changed, various substances, ordinarily foreign to its make-up, ingested by the mother." All patients were given desiccated placenta prepared as previously described (*C. A.* 11, 2492) in doses of 10 grains in a capsule 3 times a day. Only those mothers were chosen for the study whose parturition was normal and only the wts. of those infants were recorded whose sole source of nourishment was mothers' milk. The subjects were also divided into 6 groups according to wt. at birth and their wts. were recorded on the 1st, 3rd, 5th, 7th, 9th, 11th and 13th days thereafter. The growth of 177 infants was studied. The rate of growth is increased by the ingestion of the dried placenta by the mother; the postnatal decline in wt. is less and the gain in wt. after the preliminary loss is greater in every case, the mean increase over the normal % change in wt. on the 13th day being over 60%. The growth cap. of the infants is also increased, "that is to say, the maternal ingestion of dried placenta tissue so stimulates the tissues of the infants feeding upon the milk produced during this time, that unit wt. is able to add on greater increments of matter, from day to day, than can unit wt. of infants feeding on milk from mothers not ingesting this substance." There is no hypertrophy of the mammary gland or an increased milk production as a result of placenta ingestion. "There must be contained in the desiccated placenta some substance, or substances, capable of passing through the maternal organism with at least a part of its activity retained. Being secreted by the mammary glands, it is passed on to the infant in the milk, there acting as stimulus to growth. It is not illogical to suppose that these substances in the placenta *in utero* may play an important part in the growth of embryo and fetus."

A. P. LOTHROP.

**The influence of the ingestion of the amino acids, adequate and inadequate proteins upon the production of catalase.** W. E. BURGE. *Am. J. Physiol.* 47, 351-5 (1918).—The amino acids, glycine and alanine, when introduced into the intestine, cause an increase in blood catalase; glutamic and aspartic acids do not cause such an increase. These observations are in harmony with the fact that the first two amino acids increase oxidation in the body, while the last two do not. The ingestion of the digest of an adequate protein, casein, as well as of an inadequate one, gelatin, is followed by an increased catalase content of the blood.

J. F. LYMAN.

**Food value of bran for carnivora.** L. LAPICQUE AND J. CHAUSSIN. *Compt. rend. soc. biol.* 81, 319-23(1918); cf. *C. A.* 12, 1478.—In the 1st series of expts. a com. flour of 85% extn. was thrown on a No. 50 sieve. The approx. 20% of the flour which was retained was reduced between smooth rolls and again thrown on the sieve. The portion which was then retained was termed "bran" and used in the expts. Two dogs ((1) and (2) weighing 7.6 and 5.9 kg., resp.) received daily 10 g. casein and 10 g. melted beef fat apiece and in addition 160 g. and 125 g., resp., of the unsieved flour which was found to maintain them in practical equil. The flour was then sieved as already described and the 30 g. of bran which were recovered from the combined ration of 285 g. was given to dog (1) with 145 g. of sieved flour, while (2) received only 110 g. sieved flour; the wt. of (1) was approx. const., while that of (2) decreased. The corresponding proportion of bran was then returned to each dog's ration; (1) lost wt. and (2) remained practically const. in wt. For the 2nd series of expts. a white flour was prep'd. by simply grinding some Australian wheat and accepting what passed through a No. 100 sieve; the bran employed was the 1st bran from Manitoba wheat

after the latter had been subjected to 82.5% extn. In addition to the usual amts. of casein and beef fat dogs (1) and (2) received daily 133 g. and 111 g., resp., of white flour and 36 g. and 26 g., resp., of bran; both dogs remained practically in equil. The bran was then withdrawn from (1) and a double amt. (52 g.) was given to (2), the remainder of the ration being maintained unchanged; (1) lost and (2) gained wt. The original amts. (36 g. and 26 g.) of bran were then fed as usual; (1) gained and (2) lost wt. Dog (1) was then given a double ration (72 g.) of bran and the bran was withheld from (2); (1) gained and (2) lost wt. The expts. were continued for a sufficient length of time and the increase and decrease in wt. of the dogs were sufficiently pronounced (as much as 350 g. in 14 days) to warrant the conclusion that those portions of wheat which are excluded from a 80% flour but are included in a 90% flour have distinct food value for carnivorous animals such as dogs. The latter, while not so well adapted as man to digest plant food, have been habituated for generations to digest bread and constitute good subjects for such experimentation.

H. S. P.

**Requisite minimum of sugar and usually unsuspected sources of carbohydrates.** HENRI BIERRY AND PAUL PORTIER. *Compt. rend. soc. biol.* 81, 574-6(1918).—Full grown rats which received a ration of coagulated egg white, bacon (or bacon fat), H<sub>2</sub>O and salts maintained their wt. and showed practically no disturbance of nutrition provided the total amt. of food was sufficient and egg white and bacon were fed in proper proportion; acidosis ensued when the ratio between fat and albumin exceeded a certain value. This practical maintenance of equil. in the apparent absence of carbohydrates is attributed to: (1) the presence in egg albumin of carbohydrates or carbohydrate-producing substances such as free sugar, glucosamine, etc. (amounting in all to 0.8-1.0% on the basis of fresh egg albumin); (2) the role played by the glycerol content of the fat (transformation of glycerol into dihydroxyacetone with further ready transformation of the latter into a hexose by polymerization). The result represented by (2) above is in harmony with the amelioration of acetonemia after ingestion of glycerol. The wt. of available sugar in the ration used is estimated at about 1/6 of that of the neutral anhydrous fat present. The influence of the protein material present as a source of carbohydrates is in harmony with observations on the decrease in acetonuria after ingestion of meat. There is considerable variation, however, between various proteins and fats as sources of carbohydrates. Certain amino acids are generators of butyric acid and Me<sub>3</sub>CO, while other amino acids do not possess this property. Certain fatty acids are very ketogenic, others are indifferent, while still others are antiketogenic. There exists a requisite min. of sugar as well as a min. of protein and this min. of sugar varies with the nature of the proteins, fats and sugars of the diet; disturbances of metabolism are only eliminated when there is a certain balance between these factors.

H. S. PAINE.

**Experiments on the nutritive value of standard brown-bread and white-bread.** C. EIJKMAN AND D. J. HULSHOFF POL. Utrecht Univ. *Proc. Acad. Sci. Amsterdam* 21, 48-52(1918).—The standard white bread made according to government prescription contained 60% inland wheat and (or) rye flour, 10% American flour and 30% potato meal. The brown bread contained 70% unbolted wheat and (or) rye flour, 25% potato meal and 5% grits and (or) pollard. The authors state that the protein, salts and vitamins of the potato meal are lost in the prepn. and that powdered dried potatoes are, therefore, better. Six fowls about 2 years old were used in the expts., 3 being fed on the white bread and 3 on the brown bread. The ration was about 100 g. and when the appetite failed, forced feeding was resorted to. The fowls living on white bread lost wt. immediately. After 11 weeks fowl 3 developed polyneuritis and died after a few days. Fowl 2 developed polyneuritis a week later but recovered when brown bread was fed. Fowl 1 lost wt. but was not ill and recovered

its wt. when white bread was fed. As fowls living on polished rice develop polyneuritis within 5 weeks the yeast in the bread is reported as probably retarding the appearance in the above cases. Of fowls 4, 5, 6, fed on the brown bread, 4 and 5 remained in good health until the conclusion of the expt. which lasted 20 weeks. Number 6 maintained its wt. for a fortnight and then lost wt. It showed signs of polyneuritis in the 17th week and died a few weeks later. The authors conclude that brown bread yields more satisfactory results than white bread, the results holding good for human beings. They recommend a finer grinding of the bran or the removal of the coarser outer layers and the restriction of the use of white bread as much as possible. F. P.

Relative digestibility of maize oil (corn oil), cottonseed oil and lard. E. W. ROCKWOOD AND P. B. SWICKES. *J. Am. Med. Assoc.* 71, 1649-50(1918).—Three adult dogs were fed on a ration of 40 g. cracker meal, 10 g. bone ash and 155 g. chopped lean beef, freed as much as possible from visible fat. In a fore period no fat was given and the ether-sol. material of the feces was considered the "normal" output. In the fat periods 40 g. of the fat tested were included in the daily ration. The feces were marked off by lampblack, dried after the addition of alc.-acid and the ether ext. detd. as usual. The mean percentages of fat metabolized were for corn oil 98.9, cottonseed oil 98.8, and for lard 97.8. Other expts. show that corn oil can well be substituted for other animal and vegetable oils in salads, and for shortening in cooking wheat foods. L. W. RIGGS.

Substitution of saccharin for sugar. W. E. BURGE. *Univ. Ill. Science* 48, 549-50(1918).—The three functions of sugar are as a sweetening agent, an energy producer, and as an agent to increase the oxidation in the body. The present study is concerned with detg. if the ingestion of saccharin will increase the oxidation in the body as measured by the catalase content of the blood. Expts. on dogs by ingesting 4 g. of sugar or 5 g. of sol. saccharin per kg. of body wt. showed that the saccharin produced a much more extensive increase in catalase than did the sugar. It is concluded that saccharin may be positively helpful in the diet particularly in a disease, such as diabetes, which is attended with defective oxidation. L. W. RIGGS.

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#### ABNORMAL.

Studies of experimental scurvy. III. The influence of meat and various salts upon the development of scurvy. W. PITZ. *Univ. Wis. J. Biol. Chem.* 36, 439-66 (1918); cf. *C. A.* 11, 2488; 12, 2004.—"An improvement of the protein of the diet will protect guinea pigs from scurvy for a number of weeks and will greatly prolong the life of the animals, even though the physical character of the diet has not been improved. But while laxatives and lactose will prevent the development of scurvy in guinea pigs for 20 weeks, improvement in the protein of the diet, even when 10% of meat is added, will not protect them more than 13 weeks. When  $\text{Ca}_3(\text{PO}_4)_2$  was added with the meat the animals were protected for 18 weeks.  $\text{NaCl}$ , when added

to the milk, rolled oats, meat,  $\text{Ca}_3(\text{PO}_4)_2$  ration, also effected some further protection, demonstrating that low Cl is one among the many factors that may cause delay in the development of scurvy. This latter point is further emphasized by the remarkable protection afforded guinea pigs against scurvy by the ingestion of  $\text{CaCl}_2$  in the ration and shows that the Ca and Cl ions are of greater importance in the development of this disease than is P. The physical character of the diet and the character of the flora of the digestive tract are clearly of prime importance in the production of this disease, but other factors, such as those which make the diet more nearly chem. complete, which stimulate appetite and increase the flow of digestive juices and increase the resistance of the animals, which decrease the permeability of the intestinal wall, and which aid in correcting a deranged Cl metabolism, are of great importance and will protect the animals from scurvy for a considerable time. These expts. point to the little emphasized role of Ca salts in nutrition; namely, that of controlling the permeability of various animal tissues and thereby affording protection against invading agents. The sequence of events in the development of scurvy may be pictured thus: As feces accumulate in the cecum and large intestine of the animal and constipation has set in, peristalsis is decreased and the intestinal juices are secreted in less profusion, resulting in a lowering of the digestive power of the intestine and stomach and probably in the production of lesions in the intestines. Then, due to an increased permeability of the vessel walls, bacteria may invade the joints, toxic products are absorbed in greater amts. from the cecum and large intestine, and in some cases the whole protein mol. passes through the walls of the capillaries of the intestines into the blood stream. No claim is made that the retention of feces is the primary factor in the production of scurvy, but it is clearly a contributing and probably a very important factor in the development of the syndrome of this disease." A. P. LOTHROP.

**Appearance of an antiscorbutic substance during germination of cereals.** E. WEILL, G. MOURQUAND AND Mlle. PÉRONNET. *Compt. rend. soc. biol.* 81, 607-10 (1918).—Guinea pigs which received a daily ration of 50-60 g. germinated barley (equiv., after 3 days germination, to 30-40 g. dry barley) were compared with guinea pigs which were fed 25, 30-40 and 50 g. whole, dry barley and oats per day. The latter survived an av. of 26 days; clinical examn. disclosed no scorbutic symptoms, while anatomical examn. showed in general only minimal osseous modifications. The former survived an av. of 54 and 68 days (2 expts.). Pronounced symptoms of scorbutus were observed both anatomically and clinically (2-16 days before death in case of the latter). Some of the animals which were fed germinated grain lived 4 times as long as those which were given a ration of dry grain. These results contradict the supposition of Furst that antiscorbutic substances effective in the nutrition of guinea pigs are produced in cereals (barley, oats) within a 3-day period of germination. The fact that scorbutic lesions were much more pronounced in the guinea pigs which were fed germinated grain than in those which were fed dry grain was probably due to the longer survival of the former. Antiscorbutic power is developed later during the period of germination and development of the seedling, as shown by the fact that guinea pigs which were fed a mixt. of 3 days and 10 days germinated barley were normal after 200 days duration of the expt. H. S. PAINE.

**Trench sickness is due to avitaminosis.** L. BRUNTZ AND L. SPILLMANN. *Compt. rend. soc. biol.* 81, 1243-5 (1918).—Comparison of the symptoms in cases of trench sickness with those presented by animals receiving a vitamine-free ration indicates that this malady is due to lack of vitamins in the diet. H. S. PAINE.

**Diet with cirrhosis of the liver.** R. M. TEROL. *Revista Ibero-Americana de ciencias medicas, Madrid* 40, 29 (1918); *J. Am. Med. Assoc.* 71, 1447.—A milk diet is recommended as this leaves the liver in comparative repose while promoting diuresis.

An adult should take 3 liters of sterilized milk during the day by sipping a small amt. every one or two hrs. The small amts. are prescribed to avoid distending the stomach, causing retention and fermentation with results injurious to liver cells. The milk diet should be followed for a month when the ordinary diet may be slowly resumed with four small meals per day. In cirrhosis with hypertrophy the diet should be restricted to starchy foods and dry vegetables with little sugar or substances liable to putrefy. The aim is to reduce the production of toxins. In cirrhosis with atrophy, meat should be prohibited to ward off the production of toxins and salt should be restricted to 6 g. per day to guard against ascites and edema.

L. W. RIGGS.

## F. PHYSIOLOGY.

ANDREW HUNTER.

The presence of albumin in the urine of cadavers and its differentiation from pathological albumin. ERMINIO ALBERTARIO. Univ. Padua. *Arch. farm. sper.* 25, 330-6(1918).—Urine obtained from cadavers invariably contains albumin, the amt. depending upon the extent of putrefaction. The albumin comes from the walls of the bladder. It is not analogous to the so-called pseudoalbumin, since it gives a negative test for the latter, but it reacts positive with the sp. tests for pathological albumin.

A. W. DOX.

The rest nitrogen of the organs and tissues of normal and nephrectomized dogs. E. BECHER. Giessen. *Deut. Arch. klin. Med.* 128, 1-12(1918).—Besides in the blood there is also an increase in the amt. of rest N in the tissues of the most important organs after nephrectomy. It is most marked in the blood; then follow the spleen, liver, muscles, and other tissues. Under normal conditions the tissues do not contain more non-coagulable N than the blood. Calcd. by wt. most of the rest N is deposited in the muscles; then in order come the blood, liver, intestines, heart, etc. The total increased amt. of rest N deposited in all the tissues is more than the amt. of N excreted by a fasting nephrectomized dog of the same wt.

JULIAN H. LEWIS.

The metabolic gradient underlying colonic peristalsis. W. C. ALVAREZ AND ESTHER STARKWEATHER. *Am. J. Physiol.* 47, 293-301(1918); cf. *C. A.* 12, 1661.—In the colon, as in the stomach and small intestine, there are a graded catalase content and CO<sub>2</sub> production which are believed to underlie and give rise to gradients of rhythmicity, irritability and latent period which, in turn, det. the direction of peristalsis. The catalase content of colonic muscle is considerably lower than that of the more active small intestine. The gradient for the dog, cat, rat, rabbit and guinea pig was detd. There are marked differences in the gradients for the different species.

J. F. L.

Two new factors in blood coagulation—heparin and proantithrombin. W. H. HOWELL AND EMMETT HOLT. *Am. J. Physiol.* 47, 328-41(1918).—To the factors formerly recognized as concerned in blood coagulation, *vis.*, fibrinogen, thrombin, Ca, antithrombin and cephalin, there must now be added 2 others, heparin and proantithrombin. Heparin is a phosphatide having a ratio of N to P = 2.5 to 1. It is prepd. best from dog livers. It is very difficult to sep. from cephalin on account of their similar solns. Presumably it exists normally in blood, though that has not been demonstrated. Proantithrombin exists normally in blood. It is acted upon by heparin and converted, evidently by a reaction not enzymic, into antithrombin; its chem. nature is unknown. Heparin is not destroyed at 100°. Proantithrombin is rapidly destroyed in blood plasma at 70°. It may be pptd. uninjured from blood plasma by acetic acid or by (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> added to 1/2 satn.

J. F. LYMAN.

The influence of secretin on the number of red and white corpuscles and the erments and sugar content of the blood. B. FUJIMOTO. *Am. J. Physiol.* 47, 342-50 (1918).—Secretin injected subcutaneously into rabbits produces an increase in the

number of red and of white corpuscles, an increase in catalase, but no change in the diastase, glycolytic enzyme or sugar of the blood. J. F. LYMAN.

The viscosity of urine. R. BURTON-OPITZ AND ROBERT DINEGAR. *Am. J. Physiol.* 47, 220-30(1918).—An app. for detg. viscosity is described. Viscosity of pathol. urines varies much more widely than does sp. gr.; the latter is a less certain means of detg. the character of urine than the former. Normal adult urine is 1.2 times as viscous as  $H_2O$ , normal child's urine (4 to 5 yrs.) 1.1 times. Values for viscosity in some pathol. states are given. J. F. LYMAN.

Regeneration of blood serum proteins. I. Influence of fasting upon the curve of protein regeneration following plasma depletion. W. J. KERR, S. H. HURWITZ AND G. H. WHIPPLE. *Am. J. Physiol.* 47, 356-69(1918).—Plasma protein in dogs was reduced to about 50% its normal level by bleeding, and introducing into a vein washed dog corpuscles suspended in saline. Blood proteins were detd. by the refractometric method of Robertson (*C. A.* 9, 2913). In the fasting dog regeneration of serum albumin and serum globulin is a slow process, requiring 7 to 14 days. There is a tendency for globulin to be regenerated faster than albumin. There is no evidence from these expts. that serum proteins are concerned in any way as intermediary products between food protein and body tissue or parenchyma protein. Urinary N shows a primary rise for a few days following the loss of serum proteins from the body. II. Influence of diet upon the curve of protein regeneration following plasma depletion. *Ibid* 370-8.—Regeneration of serum proteins is more rapid and complete on a meat or mixed diet than during fasting. In the meat-fed dog complete regeneration may be effected in from 5 to 7 days. Regeneration is slower on a diet of bread and milk than on a diet of meat. The body appears to have about the same difficulty in regenerating its serum proteins as it does in the construction of cell protein. III. Liver injury alone; liver injury and plasma depletion; the Eck fistula combined with plasma depletion. *Ibid* 379-92.—After liver injury by  $CHCl_3$  or by P and also after the Eck fistula operation there is a marked delay in the regeneration of serum proteins. It is believed that the liver is concerned in maintaining the normal level of the blood serum proteins, a level that is remarkably const. in widely varying conditions of health and disease. J. F. LYMAN.

## G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

Action of adrenaline on the distribution of blood in man. GEORG ROSENOW. *Königsberg. Deut. Arch. klin. Med.* 127, 136-51(1918).—The intramuscular injection of adrenaline in man produces a short-lived decrease in the vol. of the forearm followed by a longer lasting increase. The increase in vol. is not due to the hindrance of the venous outflow, but to the fact that adrenaline has a stronger action on the vessels of the splanchnic area than on the periphery. The same effects of adrenaline are found in man as are found in exptl. animals. In toxic vasomotor injuries, especially of the splanchnics, adrenaline is the therapeutic agent of choice. On account of the rapidity with which the action passes off, the injections must be repeated frequently.

JULIAN H. LEWIS.

The hemolysin of paroxysmal hemoglobinuria. A. LORANT. Pozsony. *Deut. Arch. klin. Med.* 126, 148-56(1918).—The hemolysin at 0° in the serum of patients with paroxysmal hemoglobinuria is not sp. for either normal red cells or those of the patient. Therefore, it follows that the red cells of healthy people and of the patients are identical and have the same immunological properties.

JULIAN H. LEWIS.

Isolysins and autolysins in hemolytic icterus. KURT BECKMANN. *Deut. Arch. klin. Med.* 126, 305-17(1918).—In a case of acquired hemolytic icterus an isolysin and autolysin were found in the blood serum. In a case of the hereditary form of the

disease only an autolysin was found, and no isolysin. In the acquired form the hemolysin has its origin in the spleen which has an increase in its ability to destroy red cells. In the hereditary type the hemolysin is probably only secondary to an injured spleen, or is the same substance as in the acquired type but with a lower activity, and is capable only of hemolyzing previously injured cells.

JULIAN H. LEWIS.

**The blood serum in carcinoma.** CHARLOTTE LOEBNER, NÉE WRESCHNER. Tübingen. *Deut. Arch. klin. Med.* 127, 397-417(1918).—The serum of 43 patients with carcinoma was studied. The lowest protein value was 4.2%, the highest 9% with an av. of 7.3% (normal 8.2%). There seems to be a tendency toward an increase in the amt. of globulin in proportion to the albumin. The hemoglobin content of the serum rises and falls with the protein content. Of the 43 sera, 21 had a normal color, 10 were lighter, and 12 darker than normal.

JULIAN H. LEWIS.

**Tuberculin and tuberculosis.** V. REICHMANN. Jena. *Deut. Arch. klin. Med.* 126, 413-46(1918).—When tuberculin is injected into man there is a decrease in the number of lymphocytes and at the same time an increase in the number of the other leucocytes. There is no difference in the blood picture of a tuberculous individual and one injected with tuberculin. Fever alone is not a sign of a positive tuberculin reaction but is when accompanied by a decrease in the number of lymphocytes.

J. H. LEWIS.

**The cholesterol content of the blood in different forms of Bright's disease.** WILHELM STEPP. Giesens. *Deut. Arch. klin. Med.* 127, 439-67(1918).—Whenever there is a severe injury of the parenchyma of the kidney there is generally an increase in the cholesterol content of the blood. This holds true for acute as well as for glomerulonephritis. The longer a case of chronic nephritis exists, the more pronounced the interstitial changes, and the more marked the retention, the more seldom is the blood cholesterol increased. In nephritis the cholesterol value of the blood may be over 1%. The increased blood cholesterol may come from the fatty kidney or from an inability of the liver to regulate the cholesterol blood content. In a case of double nephrectomy in a dog the cholesterol content of the serum was doubled.

JULIAN H. LEWIS.

**Chemical changes in tuberculous tissues.** GEORGE T. CALDWELL. Univ. Chicago. *J. Infect. Dis.* 24, 81-113(1919).—The H<sub>2</sub>O content of normal bovine lymph glands constitutes about 81-82% of the moist wt. No very distinct differences are noted between peribronchial glands and those from the mesenteric region. The tubercle walls and the caseous material from lymph gland tubercles contain a lower % of H<sub>2</sub>O than does the normal tissue. In normal bovine liver tissue, the % of H<sub>2</sub>O is less than that of the tubercle walls or of the caseous material from liver tubercles. The specimens of caseous material from lymph gland and liver tubercles approach each other closely in their H<sub>2</sub>O content, the av. being about 75% for the bovine material. The alc.-ether-sol. substances from normal bovine lymph glands form about 24.4% of the dry wt., or about 4.4% of the moist wt. The walls of the lymph gland tubercles contain a distinctly larger amt. of lipins than does the caseous material or the normal tissue. On the contrary, the walls of the liver tubercles are poor in lipins as compared with the normal tissues, and they contain a smaller amt. of fats than does the caseous material from these tubercles. When calcd. on the basis of dry wt., the caseous material from lymph gland tubercles contains a smaller % of lipins than does the normal lymph gland tissue. When the ash is deducted, this difference disappears and the content of lipins becomes equal to or slightly greater than that of the normal tissue, but less than that of the tubercle wall. When calcd. on an ash-free basis, the lipin content of the caseous material from liver tubercles is distinctly less than that of the normal tissue but greater than the lipin content of the tubercle walls. Cholesterol forms about 6.5% of the lipins from the normal bovine lymph glands or about 1.5% of the dry wt. The lipins from the walls of lymph gland and liver tubercles contain, in every case,



2.3 times as much cholesterol as do the lipins from the normal tissues. This is an actual increase also when calcd. on the basis of the dry wt. The caseous material contains even a larger % of cholesterol than do the tubercle walls. Lecithin constitutes about 32% of the lipin fraction of normal lymph glands, or about 7.9% of the dry wt.; the corresponding values for normal liver are 41.2% of the fats, or 14% of the dry wt. The lecithin content of the fats from the tubercle walls is slightly less than that of the normal tissues, while there is a very marked reduction in the lecithin content of the lipins from caseous material of bovine origin. In caseous material from human lymph glands, lecithin formed 30.9% of the total lipins. The I nos. of the fats of the tuberculous lymph glands are higher than those of fats from the normal tissues. This observation does not hold true for liver specimens. In the latter, there is no difference between the I nos. of the lipins from normal and tuberculous specimens, although the values are practically the same as those from the fats from the lymph gland tubercles. In the residues of caseous material left after extn. with alc. and  $\text{Et}_2\text{O}$  the N content remains relatively high; in fact, the reduction in N content is only slight when the calcns. are made on ash-free residues. The % of N does not differ much from that of the normal proteins of these tissues. In caseous material in which there is no macroscopic evidence of calcification other than the presence of sandlike particles, Ca sometimes forms as much as 15% of the residue left after extn. of the fats. In such residues, the P content may reach 9%. The amt. of purine N in the walls of lymph gland tubercles is only slightly more than half that of normal lymph gland tissue, and the amt. is apparently much less in the caseous material. In the residues from the walls of liver tubercles, purine N is present in only slightly higher % than in the normal liver. The results here obtained would seem to indicate that the purines are even more abundant in the caseous residues of liver tubercles. The amt. of material which enters the  $\text{H}_2\text{O}$  soln. during extn. is distinctly less from caseous material than from the residues of normal tissues.

JULIAN H. LEWIS.

A study of the complements used in the Wassermann reaction. E. H. RUDIGER. Bismarck, N. D. *J. Infect. Dis.* 24, 120-32(1919).—The complements of fresh guinea-pig serum varied greatly in fixability, and therefore, a single complement serum is unreliable. A mixt. of 5 complement serums gave fairly uniform results. Human complement gave much weaker positive results than did guinea-pig complement. Guinea pig complement left on the clot and kept in the refrigerator remained fairly const. for 3 days, while complement which had been removed from the clots deteriorated more rapidly. Ramy's method of preserving complement by Na acetate was a total failure in the hands of the author. Glycerol seemed to prevent deterioration of complement for a few days. In complement preserved by glycerol fixability increased during the first 3 days and on the 7th day it still was nearly equal to the fresh serum.

JULIAN H. LEWIS.

The demonstration of immune opsonins for the pleomorphic streptococci in experimental poliomyelitis in monkeys. WILLA M. DAVIS. Mayo Foundation, Rochester, Minn. *J. Infect. Dis.* 24, 176-80(1918).—There occurs a well marked sp. increase in opsonins for the pleomorphic streptococcus in the serum of monkeys during attacks of poliomyelitis following the inoculation of virus. Since this increase in opsonins occurs toward strains derived from human cases as well as from exptl. poliomyelitis following the injection of virus, the pleomorphic streptococcus in this disease cannot be regarded as an accidental invader of the nervous system.

JULIAN H. LEWIS.

The nature of the proteins associated with antitoxin in antitoxic sera. ANNIE HOMER. *Proc. Physiol. Soc., J. Physiol.* 52, xxxiii(1918).—In both antitetanic and antidiphtheric sera the respective antitoxins are associated mainly with the pseudoglobulin fraction. The proportion associated with the euglobulin fraction is greater in the

former than in the latter serum. In antidyenteric serum the association of the antitoxins with the euglobulin fraction is still more marked, while in antimeningitic serum the main part is attached to the euglobulins. J. F. LYMAN.

**Antitoxic sera.** ANNIE HOMER. *Proc. Physiol. Soc., J. Physiol.* 52, xxxvii(1918); cf. *C. A.* 12, 2009.—Heat denaturation of serum proteins increases the proportion of pseudoglobulins pptd. by 28%  $(\text{NH}_4)_2\text{SO}_4$  and decreases its soly. in brine. While the activity of heat-denatured antitoxin is unimpaired, it is no longer in a condition suitable for use clinically. With serum in which approx. 30% of the protein had been denatured, the main bulk of the antitoxin was pptd. between 36 and 44%  $(\text{NH}_4)_2\text{SO}_4$  satn. Heating antitoxic sera at 56° for 15 hrs. or at 58° for 10 hrs. did not appreciably lessen the concn. of antitoxin. Heating at 65° for 30 min. caused the destruction of about 33% of the antitoxin. J. F. LYMAN.

**The influence of guanidine on the anaphylactic state.** DAVID BURNS. *Proc. Physiol. Soc., J. Physiol.* 52, xxxix(1918).—The properly regulated dose of a salt of guanidine, before or immediately after the administration of the toxic dose of serum to a sensitized animal, protects the animal in the majority of cases from anaphylactic shock. J. F. LYMAN.

ZINSSER, HANS: **Infection and Resistance. An Exposition of the Biological Phenomena Underlying the Occurrence of Infection and the Recovery of the Animal Body from Infectious Disease.** Chapter on Colloids and Colloidal Reactions by Stewart W. Young. 2nd Ed. New York: The Macmillan Co. 585 pp. \$4.25. For review see *J. Am. Med. Assoc.* 72, 596.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

**Action of sucrose in urethritis.** RAFFAELE SALADINI. Univ. Rome. *Arch. farm. sper.* 25, 374-84(1918).—Cases of blennorrhagic urethritis are reported in which injections of sucrose into the urethra gave beneficial results and rapidly reduced the urethral secretion. A. W. DOX.

**Action of sugars on the bronchial secretion.** DOMENICO LO MONACO. Univ. Rome. *Arch. farm. sper.* 25, 1-11(1918).—Subcutaneous injections of sucrose diminish the bronchial secretion in advanced stages of tuberculosis. A diminution of coughing and night-sweats is observed simultaneously. A. W. DOX.

**The action of small doses of alcohol on the orientation power of the arm and hand.** G. GYLLENSWÄRD. *Skand. Arch. Physiol.* 35, 327-47(1918); *Physiol. Abstr.* 3, 423. —Five cc. of EtOH has, 50 minutes after administration, a marked influence on the orientation power of the arm and hand, as judged by the method of Blix. F. H.-F.

**The physiologic action of cantharis.** S. MORGULIS AND A. L. MUIHEAD. *Arch. Intern. Med.* 23, 190-6(1919).—Cantharis does not experimentally induce polycythemia, inasmuch as it does not cause a production of new cells, but merely occasions a condensation of the blood through the loss of water in the process of elimination of cantharis by the kidneys. F. HULTON-FRANKEL.

**The influence of alkali administration on the urinary excretion of lactic acid, and the possible significance of the latter in maintaining neutrality in the body.** J. J. R. MACLEOD AND H. J. KNAPP. *Am. J. Physiol.* 47, 189-207(1918).—Administration of alkali, by injection or by mouth, in amts. sufficient to disturb the acid-base equil. of the body increased the output of lactic acid in the urine in rabbits, dogs, cats and men. The increased lactic acid elimination was sufficient, however, to neutralize only a small part (at the most about 5%) of the alkali given. J. F. LYMAN.

**The effect of adrenaline upon the fatigue produced by the injection of the fatigue products, lactic acid and acid potassium phosphate.** C. M. GRUBER AND O. S.

KRETSCHMER. *Am. J. Physiol.* 47, 179-84(1918).—Fatigue induced in cat muscle by perfusing lactic acid or  $\text{KH}_2\text{PO}_4$  can be counteracted by adding adrenaline to the perfusing fluid, just as fatigue produced by exercise is counteracted by the same substance. In those cases in which adrenaline has no bettering effect vasoconstriction does not occur.

J. F. LYMAN.

The antagonistic action of epinephrine to the fatigue produced by the perfusion of acid sodium phosphate. C. M. GRUBER. *Am. J. Physiol.* 47, 185-8(1918).—Fatigue induced in cat muscle by perfusing  $\text{NaH}_2\text{PO}_4$  is counteracted by epinephrine (adrenaline). Marked recovery was accompanied by an almost complete cessation of the passage of the perfusion fluid through the muscle.

J. F. LYMAN.

The stimulation and paralysis of nerve cells and nerve endings. II. Paralysis by curari, strychnine and brucine and its antagonism by nicotine. J. N. LANGLEY. Cambridge. *J. Physiol.* 52, 247-66(1918).—The paralyzing effect of curari, strychnine and brucine is on the peripheral nerve cells, on which nicotine has a stimulating action. After large doses of drugs that paralyze peripheral nerve cells, blood pressure becomes low and cannot be permanently restored by any of the methods tried, *e. g.*, injections of gelatin, Ringer fluid, 0.04%  $\text{BaCl}_2$ , 6.0% gum with  $\text{Na}_2\text{CO}_3$  (Bayliss soln.), and pituitrin.

J. F. LYMAN.

The blood-pressure curve following an intraspinal injection of adrenaline. J. AUER AND S. J. MELTZER. *Am. J. Physiol.* 47, 286-92(1918).—Adrenaline introduced intraspinaly into monkeys caused a characteristic blood pressure curve different from that obtained after intravenous injections of the drug. There is a prolonged latent period and a comparatively slow rise in blood pressure, the max. being attained only after several min.; the pressure then continued plateau-like for a fairly long time. The descent to normal was comparatively very slow. As a rule, the pressure at the end of the pressor effect has not been observed to fall below normal.

J. F. LYMAN.

The effects of strychnine and caffeine upon the rate of learning. K. S. LASHLEY. *Psychobiology* 1, 141(1917).—Albino rats were trained in the circular maze after subcutaneous injection of strychnine sulfate and of caffeine. Others were trained after similar manipulations but without the drugs, as controls. Analysis of the data obtained gives the following results: Small doses of strychnine sulfate are without effect upon the rate of habit-formation. Large doses of strychnine sulfate, sufficient to produce tremor and incoördination of movement, accelerate learning. Caffeine, in doses of 0.5 mg. or more, retards learning in direct proportion to the size of the dose. Strychnine sulfate in large doses increases the accuracy of performance of a perfected habit. Large doses of caffeine result in increased activity and reduced accuracy of performance.

D. I. MACHT.

The action of some opium alkaloids on the psychological reaction time. D. I. MACHT AND S. ISAACS. *Psychobiology* 1, 19(1917).—The effect of morphine alone and in combination with other opium alkaloids depends upon the dose used and may be manifested by a change in the mean reading, a change in the mean variation of the readings, or by both of these; and in case of association tests, by the number of errors made in performing a mathematical calcn. After small doses of morphine, there is generally a primary stage of stimulation or quickened reaction time; this may or may not be followed by a secondary stage of depression, as indicated by narcosis and prolongation of the reaction time. After larger doses of morphine, the primary stimulation stage is very short and may be overlooked, whereas the secondary or stage of depression is predominant. From the expts. made with combinations of morphine with other opium alkaloids in the form of narcophine and pantopon, it appears that morphine given in such a form is more narcotic and correspondingly more depressant to the psychic

functions than when the same dose of morphine is administered to the same subject by itself. D. I. MACHT.

**Absolute disinfection of the hands in three minutes by means of a paste containing chloride of lime.** M. MONZIOLS. *Compt. rend. soc. biol.* 81, 600-2(1918).—M. has modified an American prep. consisting of equal parts of  $\text{Na}_2\text{CO}_3$  and chloride of lime. A mixt. of 10 g. pulverized  $\text{H}_3\text{BO}_3$  and 15 g. talc (in a packet) is made into a paste with sterile  $\text{H}_2\text{O}$  and 2 g. chloride of lime (in a closed tube) testing  $28-30^\circ$  on the English chlorometric scale. The paste is applied to the hands and sterilization is effected within 3 mins. The  $\text{Na}_2\text{CO}_3$  used in the original formula was found to be unnecessary. In view of the sensitiveness of the skin to alkalis,  $\text{H}_3\text{BO}_3$  was added in order to acidify the mixt. Amts. of the paste containing 0.25-2.0 g. chloride of lime may be used for sterilizing the operatory area in surgery. Remaining traces of Cl may be finally removed from sterilized areas by washing with a 10:100  $\text{NaHSO}_3$  soln.

H. S. PAINE.

**Iodine chloride.** E. FOURNEAU AND DONARD. *Compt. rend. soc. biol.* 81, 1192-6 (1918).—Since  $\text{ICl}_3$  is subject in aq. soln. to immediate and practically complete decompn. into  $\text{HIO}_3$ ,  $\text{ICl}$  and  $\text{HCl}$ , thus causing needless wastage of I and production of undesirable acidity, F. and D. recommend the abandonment of  $\text{ICl}_3$  as an antiseptic and the substitution of  $\text{ICl}$  therefor. They advise the following method of prep.  $\text{ICl}$ . Dissolve 100 g. I and 50 g. KI in the least possible amt. of  $\text{H}_2\text{O}$ , mix the soln. with 640 cc. Javel soln. containing 77.7 parts active Cl per l. and gradually add 180 cc. of 29.57%  $\text{HCl}$ . This soln. contains 0.20 cc.  $\text{ICl}$  per cc. The reaction by which  $\text{ICl}$  in the presence of  $\text{H}_2\text{O}$  is decompd. into  $\text{HIO}_3$ , I and  $\text{HCl}$  is reversible and may be stabilized by addition of  $\text{HCl}$ .  $\text{NaCl}$  is preferable for this purpose, however, and the final soln. is prepd. by using 5 cc. of the original soln. to 1 l. of 10:1000  $\text{NaCl}$  soln. A certain proportion of the  $\text{ICl}$  is decompd. in spite of the presence of  $\text{NaCl}$ ; it is therefore better to use 7.5-10 cc. instead of 5 cc. of the original soln. Measurements of the rate of decompn. of  $\text{ICl}$  in a 10:1000  $\text{NaCl}$  soln. showed that the  $\text{ICl}$  content of the soln. decreased after 72 hrs. in the ratio 67:42.

H. S. PAINE.

**Antiseptic properties and method of using iodine monochloride.** W. MESTREZAT AND TH. CASALIS. *Compt. rend. soc. biol.* 81, 1196-9(1918).—In addition to pronounced antiseptic power  $\text{ICl}$  (cf. preceding abst.) has absolutely no caustic action on the epidermis. The soln. employed contained 1.50 g.  $\text{ICl}$  per l.

H. S. PAINE.

**Antiseptic dressing of wounds on the battlefield.** H. VINCENT. *Compt. rend. soc. biol.* 81, 1200-11(1918).—V. reports observations showing the antiseptic action of a mixt. of 1 part dry  $\text{Ca}(\text{ClO})_2$  and 9 parts powdered  $\text{H}_3\text{BO}_3$  (applied as soon as possible after infliction of the wound) in preventing infection of wounds during the interval preceding surgical intervention. P. Duval, commenting on the above, contends that the proof of this favorable antiseptic action is not yet sufficiently conclusive.

H. S. PAINE.

**Prophylactic dressing of wounds.** H. VINCENT. *Compt. rend. soc. biol.* 81, 1240-3(1918).—V. replies to Duval (cf. preceding abst.).

H. S. PAINE.

**Iodized chloroform in war surgery** (CHASSEVANT) 17.

**Alcohol: Its Action on the Human Organism.** New York: Longmans, Green & Co. 60 cents net. For review see *J. Am. Med. Assoc.* 71, 923(1918).

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Co. 674 pp. \$6.50 net. For review see *J. Am. Med. Assoc.* 71, 1243(1918); cf. *C. A.* 9, 108.

LACAPÈRE: *Le traitement de la syphilis par les composés arsénicaux.* Paris: Masson et Cie. 199 pp. 4 francs 50. For review see *Rev. sci.* 56, 606(1918).

McCLURE, CHARLES FREEMAN WILLIAMS: *On the Behavior of Bufo and Rana toward Colloidal Dyes of the Acid Azo Group (Trypan Blue and Dye No. 161) with Reference to the Portal of Entry of the Dye and the Causes which Underlie the Initiation of the Process by which Colloidal Dye Particles are Stored in the Cytoplasm of Certain Typical Cells of the Embryo and II with Reference to the Development of the Lymphatic System.* Philadelphia: The Wistar Institute of Anatomy and Biology.

### I. ZOÖLOGY.

R. A. GORTNER.

Intracellular respiration. III. Relation of the state of nutrition of paramecium to the rate of intracellular oxidation. E. J. LUND. *Univ. Minn. Am. J. Physiol.* 47, 167-77(1918); cf. *C. A.* 12, 1568.—The rate of oxidation in *Paramecium caudatum* is increased two to threefold by the ingestion of food accompanied, in these expts., by growth, but not by cell division. The change in the speed of oxidation seems correlated in some way to growth and starvation processes in the cell. IV. The rates of carbon dioxide production by starved and fed paramecia, and their possible relation to the rates of oxidation in the unfertilized and fertilized sea urchin egg. *Ibid.* 318-27(1918).—Fed paramecia produced CO<sub>2</sub> about three times as fast as did starving organisms. The magnitude of the increase in rate of oxidations after feeding a starved paramecium is similar to, although greater than, that found in animals such as the cat, dog or man after feeding protein. It is suggested that fertilization in the egg involves increase in permeability of the limiting plasma membranes around the yolk particles in the cytoplasm, which leads to digestion, absorption and synthesis of living protoplasm and hence increase in rate of oxidations just as occurs in paramecium.

J. F. LYMAN.

## 12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

The determination of lactose. E. HILDT. *Compt. rend.* 167, 756-9(1918).—In detg. lactose in milk serum, practical difficulties arise from the partial hydrolysis of the lactose, especially in dichromated samples. Upon attempting to complete the hydrolysis, to det. the glucose and galactose produced and to calc. back to lactose, it is found that there is a partial destruction of the glucose and galactose if mineral acids are employed as hydrolyzing catalysts. Better results are obtained with the sulfonic acids, such as benzenesulfonic acid, phenolsulfonic acid, or related compds. These are used in the form of the Na or Ba salts, in presence of a corresponding amt. (titrated) of H<sub>2</sub>SO<sub>4</sub>. Excellent results are obtained for lactose in aq. solns., the accuracy obtained being about 0.5%. With 1% sulfonic acid, hydrolysis is complete in 3.5-4 hrs., at a temp. of 100°. The max. reducing power so obtained does not decrease if this heating is continued for an additional 4 hrs., indicating that there is no destruction of the glucose and galactose. Milk sera hydrolyze less readily than solns. of pure lactose. Comparing results obtained from milk serum and those from dried fat-extd. solids there is a discrepancy noted if the solids are dried on the water bath at 100°. There is close agreement if the drying takes place *in vacuo*. The relation of these observations to the possible reaction between carbohydrate, polypeptides and melanoid N is not clearly explained. When exts. are dried *in vacuo*, then heated at 100°, the loss in wt. is considerable, but the amt. of CO<sub>2</sub> evolved is small.

H. M. LANCASTER.

**Conclusions relative to the milk question; sessions of the food commission of the (French) biological society.** CHARLES RICHET. *Compt. rend. soc. biol.* 81, 841-7 (1918).—The commission's conclusions were in part as follows: Industrial use of casein should be limited to the amt. absolutely required by industries essential to the national defense. Milk should be consumed with as little modification as possible. Mfr. of cheese should be permissible only when it does not involve a decrease in the milk supply of the larger cities. Milk should be concd. without removal of fat in cases where transportation facilities for immediate consumption are not adequate. Skimmed milk should not be used for feeding animals, since only a small proportion of the milk protein is rendered available for human food in the form of meat protein. The commission publishes analyses (from the Paris municipal lab.) of 48 concd. milks of various types; a no. of instances of adulteration were noted. H. S. PAINE.

**The influence of personal error, shaking and time of heating on the determination of the specific gravity and refractive index of acetic acid serum.** J. C. VAN DER HARST AND C. H. KOERS. *Middelburg. Chem. Weekblad* 15, 1517-8; *Pharm. Weekblad* 55, 1565-7 (1918).—A reply to Schoorl (*C. A.* 13, 146), citing data to show that variations in the properties of milk serum as previously reported (*C. A.* 12, 2388) were not due to personal error. A reply from Schoorl is appended, maintaining that personal error was at least a large factor. JULIAN F. SMITH.

**Determination of non-digestible residue "in vitro" by the action of pancreatin on grains or their milling products and bread.** L. DEVILLERS. *J. pharm. chim.* 18, 5-12 (1918); cf. *C. A.* 12, 2001.—In the previous method, starch is not completely dissolved, due to the enveloping gluten. To dissolve gluten previously, cover 5 g. of the cleaned whole grains with 0.2 *N*  $\text{Na}_2\text{B}_4\text{O}_7$  + 3 vols. of  $\text{H}_2\text{O}$ , add 1 cc. of 1% pancreatin soln. in  $\text{CHCl}_3$ - $\text{H}_2\text{O}$  and expose to 55° in a glass-stoppered vessel for at least 10-12 hrs. This diminishes the stickiness of the gluten. Then shake well, strain and wash with warm  $\text{H}_2\text{O}$ , return the grains to the flask, add 25 cc. 0.2 *N*  $\text{Na}_2\text{B}_4\text{O}_7$ , 3 cc. *N*  $\text{CaCl}_2$  and 2.5 cc. of pancreatin soln., fill up to 100 cc. with  $\text{H}_2\text{O}$  and digest for 2 hrs. at 55°, stirring continuously. The gluten is now dissolved. To digest the pptd. starch, proceed as in the previous method. In the case of flour, mix 5 g. thereof with 2.5 cc. of pancreatic soln. and a few drops of  $\text{H}_2\text{O}$  and heat the paste in a capsule to 55° for 30 min. The liquefied mass is then mixed with solns. of borax and pancreatin and  $\text{H}_2\text{O}$  to make 100 cc., then treated further in the same manner as the grain. In the case of bran, only 2.5 g. are taken, and of pancreatic soln. sufficiently more to moisten it. In the case of bread, the presence of gluten (although modified in baking), requires 12 to 18 hrs. heating during the 2nd digestion. Continuous stirring is here very essential. S. WALDBOTT.

**Determination of total nitrogen in two samples of bran.** BOULUD. *Compt. rend. soc. biol.* 81, 912-3 (1918).—B. reports typical total N content of bran. One sample (from Manitoba wheat ground by millstones) in the form of small glistening, clear yellow, almost transparent lamellae contained 2.11% total N; the other sample (prepd. by Pointe's method) consisted of large opaque lamellae preserving the form of the envelope of the grain and contained 1.93% of N. H. S. PAINE.

**The chemical constituents in *Cycas revolute* Thunb.** I. K. YOSHIMURA AND N. SAGAVA. *Tokyo Kwagaku Kwaishi (J. Tokyo Chem. Soc.)* 39, 1116-21 (1918).—The starch obtained from the seed and stem of the plant is used for food in the southern part of Japan. Food poisoning sometimes accompanies the use of the improperly purified product. The present study was undertaken for the isolation of a poisonous principle. The stem used for the study was obtained from the plant grown in Kagostima, Japan. It contains 21.05% air-dry matter. This air-dry matter contains 9.15% crude protein (1.45% total N, 1.21% protein N, 0.24% non-protein N), 0.56%

crude fat, 6.04% crude fiber, 3.05% ash, 81.20% sol. non-nitrogenous matter and 44.50% starch. From the hot aq. ext. of the stem, *arginine* was isolated. S. KOMATSU.

Relative digestibility of maize oil, cottonseed oil and lard (ROCKWOOD AND SWICKES) 11E. Net energy values of alfalfa hay and of starch (ARMSBY, FRIES) 11E. The action of organic acids on metals (FOUW) 9. Nutritive value of standard brown-bread and white-bread (EIJKMAN, POL) 11E.

CRUICK, WILLIAM V.: *Home and Farm Food Preservation*. New York: The Macmillan Co. \$1.50.

LEPRINCE, AND LECOQ: *Le blé et la panification*. Paris: Vigot frères. For review see *Chimie & industrie* 2, 120(1919).

MOCK & BLUM: *List of United States, British and German Patents Covering the Manufacture of Butter Substitutes, Hydrogenated Oils and Various Oils and Milk Products*. New York: Mock & Blum, 220 Broadway. 120 pp. \$25.

WING, H. H.: *Milk and Its Products*. New and revised ed. New York: The Macmillan Co. \$1.60. Cf. C. A. 7, 1563.

**Drying gluten.** G. A. OLSEN. U. S. 1,289,883, Dec. 31. Gluten is rolled into a solid mass under  $H_2O$  and this mass is then placed in an oven maintained at a temp. just slightly under  $100^\circ$  and during the slow drying of the gluten the pressure in the oven is reduced to cause the mass fully to expand and after thorough drying the pressure is gradually increased to atm. pressure, to equalize the pressure on the dried material. The pat. is "dedicated to the public" for free use.

**Preserving albumin.** M. D. M. VAN DER HAGEN and B. A. C. DAAMEN. Brit. 121,451, Mar. 15, 1918. In a process of preserving albumin by evapg. it to dryness, the albumin is mixed with milk and the mixt. evapd. at a temp. of  $100^\circ$  at atm. pressure, or a lower temp. and a reduced pressure may be employed. The process is stated to be particularly applicable to albumins derived from molluscs.

## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**Determination of the amount of chlorine required for purification of water; chlorine index.** S. COSTA AND H. PECKER. *Compt. rend. soc. biol.* 81, 167-70(1918).—The amt. of Cl, in mgs. per l., consumed by  $H_2O$  under certain definite conditions is termed the Cl index and represents the wt. of Cl required to purify and sterilize the water. The following technic is employed. Two solns. are prepd., viz.: (1) a soln. containing 200 mg.  $NaClO$  per l., 5 cc. of which are equiv. to 1 mg. Cl; (2) a  $Na_2S_2O_8$  soln. prepd. by dilg. 28.1 cc. of a 0.1 N soln. to 1 l. so that 1 cc. corresponds to 0.1 mg. Cl. Five cc. of the  $NaClO$  soln. (the Cl content of which has been accurately detd.) are added to 200 cc. of the  $H_2O$  to be examd. and the mixt. is allowed to stand 30 mins.; the available Cl is then detd. by titration with the  $Na_2S_2O_8$  soln. after addition of 10 drops of a 20:100 KI soln., 10 drops glacial  $AcOH$  and several drops of dil. starch paste. Numerous expts. showed that sterilization of  $H_2O$  is as a rule only effected when the amt. of Cl employed attains the value of the Cl index as thus detd. The index indicates the max. amt. of Cl required and addition of amts. in excess of this is unnecessary. Examn. of more than 2000 samples of  $H_2O$  showed that the Cl index varied from 0.5 to 5 mg. per l. The value of this index constitutes an excellent criterion of the character of the  $H_2O$  under examn.

H. S. PAINE.

Improvement of a hydrogen sulfide water by aëration and lime treatment. C. G. GILLESPIE. *Bull. Calif. State Bd. Health*, 1918; *Eng. Contr.* 50, 467(1918).—Aëration of a well water containing 20 p.p.m.  $H_2S$  proved satisfactory, and the addition of lime reduced hardness. LANGDON PEARSE.

Control of algae in irrigation canals by copper sulfate. R. K. TIFFANY. *U. S. Reclamation Record Nov.* 1918; *Eng. Contr.* 50, 558(1918).—Friction losses were increased by algae, which treatment with  $CuSO_4$  removed. Details are given. LANGDON PEARSE.

Need of certain investigations for increasing the efficiency of water filter plant design and operation. J. W. ARMSTRONG. *Munic. County Eng.* 56, 5-6(1919).—Urges need of data in mixing, baffling and coagulation basin design. L. P.

Operating results of slow sand filtration plant at Providence, R. I. M. H. BRONSDON. *Ann. Report, City Engineer*, 1917, *Eng. Contr.* 50, 465(1919).—Each filter was scraped 17 times a year and gave 8063.9 total hours of service, the runs being from 6.38 to 73.17 days, averaging 19.75. Bacteria (24-hr. agar  $37.5^\circ$ ) after chlorination were 10 per cc. for average of year, after filtration 20, with raw water av. 1,680. L. P.

Fine screens and chlorine meet Daytona conditions. G. W. SIMONS, JR. *Eng. News-Record* 82, 99-101(1919).—Seven % removal is obtained with sewage containing 95.7 p.p.m. suspended matter by openings  $\frac{3}{16} \times 2$  in. in Rinsch-Wurl screen, 6 ft. diam. This compares with 58 to 72% removal in tanks elsewhere in Florida. Ten cu. ft. screenings are caught per million gals. sewage. Cl applied is 5 lb. per million gals., removing 80% all bacteria. LANGDON PEARSE.

Efficiency of lime for correcting acidity in sludge. C. E. ALBRIGHT. *Phila. Bureau Surveys*, 1917 *Report*; *Eng. Contr.* 50, 460(1918).—The use of 10 lbs. lime per day had a marked effect on Imhoff sludge. Analytical data are given. LANGDON PEARSE.

Consolidation of sludge as a dewatering method. A. S. MARTIN. *Surveyor*, Oct. 25, 1918; *Eng. Contr.* 50, 467(1918).—Consolidation of sludge by pressure is workable on septic or settling tanks. A deep shaft is suggested. LANGDON PEARSE.

Sludge disposal at Providence, R. I. M. H. BRONSDON. *Ann. Rept. City Engineer* 1917; *Eng. Contr.* 50, 473(1918).—The cost of sludge disposal was \$7.10 per ton of dry solids. Details of pressing are given. LANGDON PEARSE.

Cleaning septic tank at Camp Lee. *Munic. J.* 45, 507-8(1918).—The use of an auto-ejector (auto truck with tank and pumps) is described. LANGDON PEARSE.

The Croydon and Wolverhampton sewage experiments. EDWARD WILCOX. *Assoc. Managers Sewage Disposal Works* 1918; *Eng. Contr.* 50, 413(1918).—At Croydon artificial fertilizers are being used to restore the sewage farm. At Wolverhampton settling expts. have been made on Dortmund tank designs to prevent eddies at entrance. LANGDON PEARSE.

Sewage disposal of London by sludge ships. G. W. HUMPHREYS. *Proc. Inst. Civil Engrs.* 204; *Eng. Contr.* 50, 429(1918).—Sludge ships, carrying 1000 tons each, take sludge from chem. pptn. works about 52.5 nautical miles to dump in sea, at a cost of 8.8 cents per ton including capital charges. Cost of treatment has averaged \$5.66 per mill. gals. Capital charges are included. In grains per gal., 4 of  $CaO$  and 1 of  $FeSO_4$  are used. LANGDON PEARSE.

Waste products of cities and the war. W. T. KNOWLTON. *League Calif. Municipalities* 1918; *Munic. J.* 45, 510-3(1918).—The wastes discussed are ashes, rubbish, sewage, street sweepings, trade wastes, dead animals and garbage. Details of disposal are given. LANGDON PEARSE.



Carbon tetrachloride vapor as a delousing agent. M. H. FOSTER. *Public Health Repts.* 1918, 1823-7. (Reprint No. 489.)

Water softening for textile purposes (KING, CHAMBERS) 25.

KINNICUTT, LEONARD P., WINSLOW, C. E. A. AND PRATT, R. WINTHROP: *Sewage Disposal*. 2nd Ed. Rewritten. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 547 pp. \$4.

Apparatus for bacterial treatment and separation of solids from sewage. P. F. BROWN. U. S. 1,289,378, Dec. 31. The app. is of the Imhoff type.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

Organic phosphorus of soil: experimental work on methods for extraction and determination. C. J. SCHOLLENBERGER. Ohio Agr. Expt. Station. *Soil Science* 6, 365-95(1918).—A detailed description is given of a modification of the Potter and Benton method (*C. A.* 10, 2950) for detg. inorg. P, and of the Neumann method for detg. total P in the  $\text{NH}_3$  ext. of soils. An outline is also given of what were found to be the most favorable conditions for the preliminary removal of bases from the soil, and of the best conditions, with respect to strength of  $\text{NH}_3$  soln., time of digestion, etc., for the prepn. of ammoniacal exts. intended for the study of the soil content of organic P. It is shown that as solvents for the organic P of the soil studied, solns. of the hydroxides of the fixed alkalis are not superior to  $\text{NH}_3$ . One extn. by  $\text{NH}_3$  when carried out under the proper conditions was found to remove practically all the organic P from the soil that is capable of being taken into soln. by  $\text{NH}_3$ . No consistent relations were observed in these solns. between the content of  $\text{NH}_3$ -sol. org. matter (humus), humus ash,  $\text{SiO}_2$ ,  $\text{Fe}_2\text{O}_3$ , and  $\text{Al}_2\text{O}_3$ ; nor between the total org. matter and the organic P in  $\text{NH}_3$ -exts. prepd. in various ways, although there was a general tendency for these to vary together. The most satisfactory method for sepg. clay from ammoniacal soil exts., having in view the max. content of org. P, was found to consist in filtering the ext. through a layer of the soil itself supported by a flat paper filter on a Buchner funnel as described by McIntire and Hardy (*C. A.* 9, 346). Evidence is presented that inorg. P adsorbed by colloids, org. or inorg., is not included in the apparent content of org. P as detd. by the methods used. Detns. of humus, color and org. P in  $\text{NH}_3$ -exts. of 4 depths of the soil indicate that these  $\text{NH}_3$ -sol. constituents are present in about the same relative proportions in the 4 depths examd. The total N content of the same 4 depths of soil stand in ratios very similar to those exhibited by the  $\text{NH}_3$ -sol. constituents named.

W. H. ROSS.

Accurate determination of soil nitrates by the phenoldisulfonic acid method H. A. NOYES. *J. Ind. Eng. Chem.* 11, 213-8(1919).—The *modified* method is given in detail and those conditions under which, and directions as to how, details are to be varied are included. The more important points considered in working out the *modified* method were: variations between soils, the extn. of nitrates, the presence of chlorides, the filtration of soil and water mixts., the removal of interfering substances, quantity of soil to use, reagents and methods of using, the colorimeter and how to use it. Data are given for soils of widely different origin, compn. and reaction showing that nitrates are extd. from soils by distd. water, that the *modified* method overcomes inaccuracies caused by the presence of chlorides by keeping down temps. and prevent-

ing violent localized exothermic reactions and that freshly prepd.  $\text{Ca(OH)}_2$  removes interfering coloring matter and throws sol. iron out of soln. Special reasons are given for the selection of the Schreiner colorimeter (*J. Am. Chem. Soc.* 27, 1192(1905)). The colorimeter readings for the 74 soils and conditions investigated are given.

H. A. NOYES.

**Soluble salt content of soils and some factors affecting it.** M. M. MCCOOL AND C. E. MILLAR. East Lansing. Michigan Agr. Expt. Station, *Tech. Bull.* 43, pp. 1-47(1918).—By the freezing point method (*C. A.* 9, 3316) of measuring the concn. of the soil soln. it is shown that the translocation of salts in the soil is due mainly to water movements. When large quantities of salt are present there is a movement to areas of lower concn. even when water movements are prevented. Higher water contents of the soil aid this movement. Since the sol. salt content of field soils is relatively low, according to the data presented, it is thought probable that plants are supplied with food elements by diffusion from local areas around the roots only. The accumulation of sol. salts on the surface of uncropped areas indicates that when water movements occur in the soil, salts are carried along with it. That these movements do not take place to any great depth is evidenced by the results of various investigations showing but little movement of water from the subsoil to the feeding zone of the roots. It is considered improbable that any great quantity of sol. material is supplied to the plants from depths below those of root penetration. The quantity of sol. salts in greenhouse soils may become too great for proper plant development, and in certain muck soils plant growth may be inhibited by the accumulation of sol. substances in the upper layers. Expts. made with corn and barley cultures show that plants may materially reduce the sol. salt content of the soil. Field expts. also give evidence in the same direction, but to a less marked degree. As a result of lab. expts. it would appear further that the constituents of soils which have been cropped for a long period of years go into soln. at a somewhat slower rate than do those of the corresponding virgin soils. The rate of soln. in the case of the soils studied is governed to some extent by temp.; it is more rapid at  $25^\circ$  than at temps. approaching  $0^\circ$ . The moisture content, moreover, has a marked influence on the rate of soly. of the soil constituents, and it is pointed out that biological activities probably play an important role in these phenomena. A seasonal variation in the salt content of field soils was shown by an examn. of several soil classes at different periods during the spring and summer months. In the case of all the mineral soils tested, there was noted a tendency for the soil soln. to reach a max. concn. in the early summer when plant growth is at a max. The behavior of a muck soil used in the expts. was radically different especially during the latter part of the season when a decided tendency for the concn. of the soil soln. to increase still further was manifested. It is suggested that the seasonable variation in the sol. salt content of soils may play an important role in the results obtained from the use of fertilizers. The work is being continued. W. H. ROSS.

**Determining the absolute salt content of soils by means of the freezing-point method.** GEORGE J. BOUYOUCOS AND M. M. MCCOOL. Mich. Agr. Expt. Sta. *J. Agr. Research* 15, 331-6(1918); cf. *C. A.* 10, 1687, 2381; 12, 1094.—After they were washed several times with distd.  $\text{H}_2\text{O}$  the lowering in the f. p. of several soils was found to be almost uniform,  $0.0007^\circ$  for heavy sandy loam, loam, clay loam and clays; and  $0.005^\circ$  for sands and light sandy loams. This indicated that at a high moisture content or in excess of  $\text{H}_2\text{O}$  the f. p. method could be used to det. the abs. salt content of all normal soils with a high degree of accuracy. That air-drying does not introduce any error was shown by taking the f. p. of 15 samples of soil before and after air drying, all samples having first been washed until practically all the sol. salts were removed. Detns. of the f. p. were made with 14 samples of soil under varying conditions of season,

rainfall, culture, and at various depths, 15 g. of the soil being mixed with 10 cc. of  $H_2O$  (in the light soils the proportion being 20 g. to 10 cc. of  $H_2O$ ). The results show that the season of the year, the amt. of rainfall and the time elapsing after a rain, temp., rate of evapn., cultural conditions of the field, and depth of sampling all cause variations in the lowering of the f. p. from 0.010 to 0.200°. (Cf. C. A. 12, 732.)

R. N. HARGER.

**Soil factors affecting the toxicity of alkali.** F. S. HARRIS AND D. W. PITTMAN. Utah Agr. Expt. Sta. *J. Agr. Research* 15, 287-319(1918); cf. C. A. 10, 83.—Ten grains of wheat were planted in 200 g. of soil contg. amts. of NaCl ranging from 0 to 4000 p. p. m., or  $Na_2CO_3$  or  $Na_2SO_4$  in amts. ranging from 0-10000 p. p. m. The influence of the texture of the soil, amt. of org. matter and moisture content were studied. To show the effect of these various factors upon the toxicity of the salts data were obtained as to number of seeds germinating and total wt. of dry matter exclusive of roots at the end of 21 days. In all, 12000 such expts. were carried out. The results are shown graphically. The authors found that mere size of soil particles had no appreciable effect upon the toxicity of the salts but that loams were more tolerant of the salts than either sand or clay, the coarse loams being the most tolerant. Org. matter increased the resistance to alkali when the soil was sufficiently moist, but in a soil of limited moisture content it decreased the resistance. Increase of moisture up to the max. that will produce good crops increased the resistance to alkali. Up to 3000-4000 p. p. m. the three salts were beneficial,  $Na_2CO_3$  being most so in greater concns. The order of toxicity was:  $Na_2SO_4$ ,  $Na_2CO_3$ , NaCl, the last being most toxic. To ascertain the actual concn. of the solns. used, solns. of the salts were added to mixts. of varying proportions of sand and loam and the f. p. was detd. The f. p. was much lower where the % of loam was high, showing that the soil had absorbed some of the salt; where the % of sand was high the f. p. was generally higher, indicating that the soil had a greater affinity for  $H_2O$  than for the salt.

R. N. HARGER.

**Ash absorption by spinach from concentrated soil solutions.** RODNEY H. TRUE, OTIS F. BLACK AND JAMES W. KELLY. Bur. Plant Industry, U. S. Dept. Agr. *J. Agr. Research* 16, 15-25(1919); cf. C. A. 12, 2208; 13, 613.—Spinach plants were grown in soils which had been fertilized with manure, "acid complete," "basic complete," or very large treatments of acid phosphate,  $CaCO_3$ , KCl, NaCl,  $Na_2SO_4$ , or  $NaNO_3$ . Data are given showing the effect upon the growth of the plants, and the amt. and compn. of the ash, the ash from roots and tops being analyzed separately. The best results were secured with fertilizers having a basic nature. Acid phosphate and  $Na_2SO_4$  also gave good results, while the others produced poor growth, KCl giving the lowest yields. The total ash of the tops was highest with NaCl,  $CaCO_3$ , and acid phosphate and lowest with KCl and "basic complete," while in the roots the highest ash was with acid phosphate and manure and lowest with KCl and Na salts. The only ash constituents showing any great variations were  $SiO_2$ ,  $K_2O$  and  $Na_2O$ .  $CaCO_3$  and acid phosphate caused  $SiO_2$  to be very high in both tops and roots.  $K_2O$  was high in the presence of  $Na_2SO_4$  and manure and very low with NaCl and low with acid phosphate, while with KCl the  $K_2O$  content was medium. In the tops the  $Na_2O$  was very high with NaCl and high with  $Na_2SO_4$ . In the cases of  $SiO_2$  and  $K_2O$ ,  $Na_2O$  and  $CaO$ , and  $K_2O$  and  $MgO$  the high absorption of one constituent was accompanied by the low absorption of the other. The results suggest that Na may in some cases replace K in spinach fertilizer and since the Mg-Ca ratio is greater than unity the authors suggest the use of Mg salts in fertilizer for this crop.

R. N. HARGER.

**Champaign county soils.** C. G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE AND F. W. GARRETT. Illinois Agr. Exp. Sta., *Soil Rpt.* No. 18, 61 pp.(1918).—The results

of chem. analysis and fertilizer expts. on the principal soil types of the county are given. The soils are mapped into 4 groups, the upland prairie soils comprizing over 90% of the area. The plant food elements of the different soils vary widely. The upland prairie soils are generally higher in these constituents. The org. matter of the upland prairie soils is also higher than that of the upland timber or terrace soils. More than 80% of the soils of the area contain no lime to a depth of 20 inches. P fertilizers gave increased crop yields, when applied with org. débris. J. J. SKINNER.

**Pecan rosette in relation to soil deficiencies.** S. M. McMURRAN. U. S. Dept. Agr. *Bull.* 756, pp. 11(1919).—Pecan rosette is almost unknown on the river flood plain soils of southern Louisiana; here the soil is deep and black, of high fertility and  $H_2O$ -holding capacity as compared with the typical sand and sandy clay of the Atlantic and Gulf Coastal plains, where the disease is so widely prevalent. The rosette of pecans appears to be associated with soil conditions; its occurrence is most prevalent in soils of low crop-producing power. Lime expts. show that liming the soil does not prevent the disease, nor is there any correlation between acid soils and rosetting. The incorporation of large amts. of stable manure in the soil improved the growth and partially prevented the outbreak of the disease. J. J. SKINNER.

**Some general information on lime and its uses and functions in soils.** M. M. MCCOOL AND C. E. MILLAR. Michigan Agr. Exp. Sta. *Special Bull.* 91, pp. 21 (1918).—The sources of lime in Michigan are limestone deposits, and marl beds. The changes which lime undergoes in the soil are discussed and general information is given. J. J. SKINNER.

**Soil investigation at Soerabaja.** P. A. A. F. EIJKEN. *Geneesk. Tijdschr. v. Ned.-Indië* 58, 113-39; *Chem. Weekblad* 15, 1519-20(1918).—Report of a bacteriol. and chem. investigation of the soil in the vicinity of Soerabaja, in connection with plans for a sewer system. The use of septic tanks with underground outlets is recommended on the basis of the findings. JULIAN F. SMITH.

**Effect of sulfonation and nitrification on rock phosphate.** J. W. AMES AND T. E. RICHMOND. Ohio Agr. Expt. Station. *Soil Science* 6, 351-64(1918); cf. C. A. 12, 1676.—A study was made of the action on rock phosphate of the acidity produced by the oxidation of S and of N compds. when incorporated separately or combined with the phosphate in different soils. In the sulfonation expts., 2 g. of S were added to 500 g. portions of the soil without and with varying amts. of  $CaCO_3$ , in order to study the effect of the processes in acid soils and in soils supplied with basic material. In an acid soil the oxidation of the S was found to proceed vigorously, approx. 50% being changed to the form of sulfate. The addition of  $CaCO_3$  to an acid soil depressed sulfonation somewhat, but in sand mixts. the presence of  $CaCO_3$  was found to be essential. In the absence of other bases the Ca of rock phosphate did not serve as a base for the sulfofying process to any appreciable extent. When phosphate rock was added to an acid silt loam at the rate of 1900 parts per million, the oxidation of S incorporated with the phosphate in the absence of  $CaCO_3$ , or N carriers, changed 630 parts of P into a form sol. in neutral ammonium citrate soln. In a basic soil, or when  $CaCO_3$  was added to the mixt., the acidity resulting from sulfonation was neutralized by the Ca present as carbonate, and the solvent action on the phosphate was therefore much less than occurred in the acid soil. When S and dried blood were added to an acid soil, the oxidation of the S proceeded actively but nitrification in the absence of  $CaCO_3$  was practically inhibited by the acidity resulting from the oxidation of the S. The transition from protein apparently ended with the formation of  $NH_3$ , which in turn reacted to neutralize the acidity arising from the sulfofying organisms. Less P was consequently changed to a sol. form when blood was added to rock phosphate and S in soil mixts. than when the S and phosphate were used alone. With  $(NH_4)_2SO_4$  there

was a still further decrease in the amt. of citrate-sol. P. Whatever action the  $(\text{NH}_4)_2\text{SO}_4$  has had is attributed to the sulfate ion rather than to biochem. action since nitrification of  $\text{NH}_3$  did not occur in a soil deficient in bases unless  $\text{CaCO}_3$  was added. Nitrification is stimulated by rock phosphate to a very limited extent. It is not an active agent for increasing the soly. of rock phosphate mixed with soil, and evidence is given to show that the Ca of the soil existing chiefly as silicates and partly in other combinations is almost, if not altogether, as readily attacked as rock phosphate.

W. H. Ross.

A preliminary study of the influence of chlorides on the growth of certain agricultural plants. W. E. TOTTINGHAM. *J. Am. Soc. Agron.* 11, 1-32(1919).—In a review of the previous field and greenhouse investigations on the effect of chlorides upon the growth and compn. of plants extremely variable results are shown to have been obtained. This is attributed to differences in the species of the plant, the type of soil, and especially to the complex factors considered as climate. In the present investigation the introduction of KCl and NaCl into water cultures was found to affect but slightly wheat plants during the first 5 weeks of their germination. Buckwheat grown to apparent maturity in similar cultures was decidedly affected by the application of these chlorides. Although seed production remained apparently undisturbed, the length of roots and the yield of dry matter was depressed. This effect was most pronounced in the presence of NaCl. Radish responded only slightly, in yield and compn., to the application of KCl and NaCl along with complete fertilizer in soil cultures in the greenhouse. Under similar conditions increased production of dry matter and of the percentages of sugars therein resulted with the carrot, while the reverse was true of the parsnip. In the latter case NaCl was particularly injurious. The sugar beet gave the same general responses to chlorides as did the carrot when grown in the greenhouse. While the roots were more watery where chlorides were applied, the yield of dry matter was greatly increased. The dry matter of such roots contained more glucose, but less sucrose, than that obtained from cultures in soil not receiving chlorides. Similar responses followed the application of common salt alone to beets grown in the field. The potato produced increased yields of dry matter in the tuber when KCl was supplied in place of  $\text{K}_2\text{SO}_4$  in a complete fertilizer ration to soil cultures in the greenhouse. Relative to the percentage of starch different varieties were found to respond differently. The results indicated that the variety of plant was more important than the type of soil in detg. this effect of chlorides. In field cultures in a dry season the application of KCl in a complete fertilizer decreased the yield of dry matter in the tubers, but in a season which was very humid towards its close no significant differences in compn. or cooking quality were found between tubers produced where  $\text{K}_2\text{SO}_4$  and KCl were employed separately in a complete fertilizer ration. NaCl applied alone altered the compn. of the tubers only slightly, but affected their quality seriously. The paper is followed by a full bibliography.

W. H. Ross.

New ways for the application of waste-water clarification sediment as fertilizer. M. STRELL. *Munich. Landw. Vers. Sta.* 90, 257(1917); *Biedermanns Zentr.* 47, 311-3(1918).—"Hawin" is a black-brown pasty mass obtained by the treatment of brown coal with NaOH soln. It dissolves in  $\text{H}_2\text{O}$  forming a deep brown colloidal soln. When 2-3 cc. of a 10% soln. of "hawin" and 1.5 cc. of a 10% soln. of  $\text{Al}_2(\text{SO}_4)_3$  are added to a l. of the water coarse flocculent particles form immediately and envelop the finest and apparently dissolved org. matter of the water and carry it to the bottom. The sediment settled in 10 min. is voluminous but is easily filtered, washed and dried. The study of the influence of the "hawin" soln. upon the nitrifiability of org. N compds. showed a favorable action especially with respect to the activity of the nitrite-forming bacteria. Nitrates could be demonstrated as present in the filtrates of the "hawin"

sediment but not in such const. quantities as nitrites. The nitrification of org. N compds. such as are present in large amts. in waste waters and in stable manures is decidedly hastened by the admixt. of humus-like substances. ALBERT R. MERZ.

**Fumigation of Cattleya orchids with hydrocyanic-acid gas.** E. R. SASSCER AND H. F. DIETRZ. Federal Horticultural Board. *J. Agr. Research* 15, 263-9(1918).—The larvae of the black walnut worm were placed in a variety of containers consisting of multiple coverings of cardboard, pill-boxes, sacks, etc., and subjected to fumigation with HCN gas under vacuum conditions, a dosage of one ounce of NaCN per 100 cu. ft. being employed. All larvae were killed. To det. whether such fumigation is harmful to Cattleya orchids, expts. were carried out with a large number of sound and damaged orchids, under varying conditions of moisture, and wrapping. While the fumigated plants lost their leaves more rapidly than the unfumigated plants, it was mostly the old leaves that fell and the fumigation is not responsible for the appearance of black or yellow areas on the plants and does not injure the bulb. Moisture was found to have no influence on the effect of HCN upon the plants. In some cases the HCN seemed actually to accelerate the growth. R. N. HARGER.

Potash content of blast furnace charges (GELLERT) 18. The Croydon and Wolverhampton sewage experiments (WILCOX) 14.

GAIN, EDMOND: *Précis de chimie agricole*. 2nd Ed. Paris: J. B. Bailliére et Fils. 510 pp.

KING, F. H.: *The Soil: Its Nature, Relations and Fundamental Principles of Management*. New York: The Macmillan Co. \$1.50.

LYON, T. L., FIPPIN, E. O. AND BUCKMAN, H. O.: *Soils: their Properties and Management*. Revized Ed. New York: The Macmillan Co. \$1.90.

VOORHEES, EDWIN B.: *Fertilizers*. New Ed. New York: The Macmillan Co. \$1.50. Cf. C. A. 10, 3133.

**Fertilizer.** L. L. JACKSON. U. S. 1,289,789, Dec. 31. Feldspar is digested with an excess of lime and with about six times as much  $H_2O$  as lime at a temp. of about  $95^\circ$  for 10 hrs. The solids and liquid from the digestion are sepd. by filtration and the soln. is treated with  $CO_2$  and evapd. to dryness. The filter cake is treated with sufficient  $CO_2$  to combine with the  $Ca(OH)_2$  which it contains and in washing and further treatment Al compds. present are converted into  $Al(OH)_3$ . Dried alkali metal salts from the soln. first obtained are mixed with the product containing  $CaCO_3$  and  $Al(OH)_3$  and the mixt. may be used as a fertilizer. The solids from the digestion of the feldspar may be treated with waste  $H_2SO_4$  or  $NaHSO_4$  (instead of  $CO_2$ ) to convert the  $Ca(OH)_2$  into  $CaSO_4$ ,  $Na_2SO_4$  being recovered as a by-product with subsequent formation of Na alum.

**Fumigants.** E. W. BLACKER. Brit. 121,265, Sept. 19, 1918. A fumigant for destroying rabbits, rats, wasps, etc., consists of 2 oz. powdered S, 2 oz. saltpeter, 0.5 oz. turpentine or paraffin oil, and 0.5 oz. grease or treacle, mixed together to form a paste. The compn. may be spread on a small sheet of canvas, etc., which is then rolled up into a cartridge and tied round with string.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

**Detection of added water in wines.** W. I. BARAGIOLA. *Schweiz. Apoth. Ztg.* 56, 537-40(1918).—B. gives in detail the method of Tissier and François (C. A. 8, 3481).

and a brief note of U. Pratolongo (*Stas. sper. agr. ital.* 51, 56-60(1918); cf. *C. A.* 12, 2107). In the latter method, 2 samples of wine are satd., 1 with  $\text{KHC}_4\text{H}_4\text{O}_6$ , the other with  $\text{CaC}_4\text{H}_4\text{O}_6$ , allowed to stand for 30 min. at 50 to 60°, cooled and (a) the amt. of absorbed  $\text{KHC}_4\text{H}_4\text{O}_6$  is detd. by titration of total acid before and after treatment and (b) the amt. of  $\text{CaC}_4\text{H}_4\text{O}_6$  by gravimetric detn. of Ca before and after the satn. expt.

S. WALDBOTT.

**Reducing the acidity of wines with dipotassium tartrate.** W. I. BARAGIOLA. *Mitt. Lebensm. Hyg.* 9, 285-7(1918).—The amt. of di-K tartrate necessary to lower the dissociation of the tartaric acid in wines enough to change the taste is not enough to ppt. acid K tartrate, but it is enough to make the total tartaric acid value greater than 45% of the non-volatile acid. This might make the wine appear to be dild. and treated with free tartaric acid.

H. E. WOODWARD.

**Extract of beer.** H. HEUSER. U. S. 1,290,191, Jan. 7. An ext. produced by fermenting a grain mixt. or mash and concg. *in vacuo* is cooled to yeast-fermentation temp. and fermented with yeast and yeast nutrients with stirring to expedite fermentation. A large quantity of yeast is used and the proportion of added fermentable carbohydrates is adjusted to control the content of alc. in the product as desired. The ext. is charged with  $\text{CO}_2$  and, for use, it may be dild. with  $\text{H}_2\text{O}$  to obtain a beverage of low alc. content but otherwise generally resembling ordinary beer. U. S. 1,290,192 describes the treatment of an unfermented beer wort, containing 7% fermentable and 7% unfermentable substances, with 1 lb. of thick-fluid yeast to the bbl. and fermenting at a temp. of about 10°. After the described degree of fermentation, fermentation is arrested by filtering out the yeast, and the wort is concd. to a sirupy consistency *in vacuo*. The concd. ext. is then subjected to a second fermentation with yeast as in the process of the preceding pat.

## 17. PHARMACEUTICAL CHEMISTRY:

W. O. EMERY.

**The pharmaceutical chemist and the scope of his work.** FRANK O. TAYLOR. *J. Ind. Eng. Chem.* 11, 239-42(1919).—An address.

E. J. C.

**Essence of shuei flower (*Jasminum odoratissimum*, L.).** RIKITA TSUCHIHASHI AND SAICHI TASAKI. *J. Chem. Ind. (Japan)* 21, 1117(1918).—This flower, which is cultivated in Formosa, is noted for its fragrancy. From 90 kg. of fresh flowers 250 g. or 0.277% of essence were obtained by extn. with petr.-ether. The essence was sepd. into an oil (yield 0.116%) and a so-called flower wax (yield 0.166%). The enfleurage process was tried but was not successful. *Shuei flower oil* is reddish brown, has  $d_{15}^{20}$  0.9309,  $n_D^{18}$  1.4845,  $[\alpha]_D^{15}$  + 5.64, acid no. 5.85, sapon. no. 92.25, sapon. no. after acetylation 186.20. The oil was fractionated by distn. under reduced pressure. About 57% came over between 170 and 200° at a pressure of 3.5 to 4 mm. Eleven fractions are described. The compn. is approx. as follows: *d*-Linalool 6%, *d*-linalool acetate 6%, benzyl alc. 1.6%, benzyl acetate 6%, indole and methyl anthranilate 10% and high-boiling parts [sesquiterpene alc. or diterpene alc. (?) ] 57%. *Shuei flower oil* differs from the flower oil of *Jasminum grandiflorum*, L, described by Hesse and Müller (*Ber.* 34, 2929(1901)). *Shuei flower wax* has  $d_{15}^{100}$  0.8259,  $n_D^{60}$  1.4622,  $[\alpha]_D^{18}$  + 0.11, acid no. 1.25, sapon. no. 67.53, unsapon. matter 67.07%, I no. 100.0 (Hüble), R.-M. no. 1.0 and m. 45-57°. It contains 67% of triacontane,  $\text{C}_{30}\text{H}_{62}$ .

E. J. C.

**Substitute for cacao butter for making cast suppositories.** LEO BEHRBALK. *Pharm. Post* 51, 562(1918); *Chem. Zentr.* 1918, II, 760.—A mixt. which can be used for

making cast, but not pressed, suppositories consists of 1 part spermaceti and 3 parts olive oil. It m.  $37.2^{\circ}$ . C. O. EWING.

Is the introduction of tests of glassware necessary in the forthcoming German pharmacopeia? LUDWIG KROEBER. *Pharm. Zentralhalle* 59, 223-7, 233-7(1918); *Chem. Zentr.* 1918, II, 759.—Tests for glassware in the next Ger. Pharm. are desirable. A quick rough test for sol. alkali follows: Place 100 cc.  $H_2O$  in the vessel to be tested, add 2-3 drops of alc. phenolphthalein soln., and set aside 1 hr. The soln. should not show more than a bluish rose color and should not require over 2-3 drops 0.1 N HCl to decolorize. Anneller's narcotine-HCl test is more accurate; the vessel to be tested is filled with a 0.1% soln. of narcotine-HCl and set aside; at room temp. medicine bottles should give no ppt. or, at most, traces only of a flocculent ppt. in 0.25 hr.; under no circumstances should a cloud-like agglomerate be formed. Ampoules and measuring app. should not show more than traces of a flocculent ppt. in 0.5 hr. and the ppt. should not increase in a 2nd 0.5 hr. C. O. EWING.

Disadvantage of using heat in making *sapo mollis*, U. S. P. L. STEMPLE. *Merck's Report* 28, 17(1919).—In order to avoid the frothing and the danger of ignition of the alc. in the prepn. of *sapo mollis*, the U. S. P. process is modified as follows: Dissolve the KOH in the  $H_2O$ , add the alc. and mix well; then add the oil in several portions and stir until the soap assumes the consistency of a paste. The heat of reaction is sufficient for the process. The process can also be used in the prepn. of liquor cresolis compositus; the soap is first made and while still warm is dissolved in the cresol. C. O. EWING.

Acetylsalicylic acid. H. L. DAHM. *J. Ind. Eng. Chem.* 11, 29-30(1919).—The work is summarized as follows: A modification of the usual U. S. P. method of taking m. p., applicable to acetylsalicylic acid, is given. A set of permanent color standards for use in detg. the approximate amts. of salicylic acid in acetylsalicylic acid, with directions for prepn., is described. Results of previous investigators as to quality and purity of Am. and foreign aspirin were confirmed, by tests made over a period of 1 year. W. O. E.

Alkaloids of opium. D. B. DORR. *J. Soc. Chem. Ind.* 37, 430-1R(1919).—A brief description of 2 leading methods for isolating the alkaloids from opium, with especial reference to morphine, codeine, thebaine, narcotine, papaverine and narceine. W. O. E.

Physiological action of essential oils. I, II. S. FURUKAWA. *J. Tokyo Chem. Soc.* 39, 584-660, 809-45(1918).—The relation between chem. constitution and physiol. action was studied on a large number of perfumes and essential oils. Alicyclic alcs. which contain the CHOH group and their esters show a cooling taste. The lower aldehydes, alcs. and acids show cool, warm and acidic tastes, resp., and these tastes change to astringent in a higher homolog of each substance. Aromatic hydrocarbons and ketones show stimulus and bitter taste resp. A loach was kept in perfume solns. of various concns. for 24 hrs. and the toxic and narcotic actions of the perfumes were observed. In a homologous series, the toxic effect is decreased with increasing mol. wt. of the substance. The narcotic effect, however, is increased. In general, the total physiol. action, that is, the sum of both toxic and narcotic effects, is proportional to the mol. magnitude, within a certain limit, above which the soly. in  $H_2O$  or lipoids decreases suddenly. The author has extended his idea exptly. on the theory of narcosis and also on the physiol. meaning of perfume in a plant. S. KOMATSU.

Mode of mercurial embalming in the medieval epoch. GEORGES-A. LEROY. *Compt. rend.* 167, 996-8(1918).—In the museum of antiquities at Rouen are remains of John of Lancaster, Duke of Bedford, who died in 1435, consisting of a lock of hair



and about 50 g. of a blackish solid containing globules of Hg. These remains were removed from a grave in the cathedral of Rouen in 1866, and were at that time examd. by J. Girardin, who reported the compn. as Hg 11.25, matter sol. in water (including neither Cl nor  $\text{H}_2\text{SO}_4$ ) 11.33, balsamic resin having the characters of benzoin 8.20, "matieres org. insol. azotique (sic)" 59.00, water and loss 10.20. Girardin concluded that neither  $\text{HgCl}_2$  nor  $\text{HgSO}_4$  was employed, but that the metallic Hg resulted from the use of  $\text{HgO}$ . Twenty years later he admitted that the Hg was probably used as  $\text{HgCl}_2$ . Le Roy's study gave the following results: The embalming paste is a dry, black, friable, and spongy solid, sp. gr. 1.214, with globules of Hg disseminated throughout. Chem. analysis shows a neutral reaction to turnesole,  $\text{H}_2\text{O}$  at  $105^\circ$  9.90,  $\text{Et}_2\text{O}$  ext. 1.76, alc. ext. 2.68,  $\text{H}_2\text{O}$  ext. 3.44, mineral matter 30.60, matter volatile at red heat 69.40, insol. in  $\text{H}_2\text{O}$  43.65, Hg 8.03, org. N 1.93, water-sol. N 0.189,  $\text{NH}_3$  0.017, nitrates chlorides and sulfates in traces, carbonates, tannates and cupro-potassic reducing substances absent. The 30.60% of mineral matter contained  $\text{CaSO}_4$  0.72 with traces of chlorides; 11.948 sol. in HCl consisting of combined  $\text{P}_2\text{O}_5$  0.664, combined  $\text{SO}_3$  0.998,  $\text{Al}_2\text{O}_3$  4.38,  $\text{Fe}_2\text{O}_3$  0.420,  $\text{CaO}$  2.224,  $\text{MgO}$  0.202,  $\text{Na}_2\text{O}$  1.481,  $\text{K}_2\text{O}$  0.859. The 18.552% insol. in HCl contained  $\text{SiO}_2$  17.685,  $\text{Al}_2\text{O}_3$  0.660,  $\text{Fe}_2\text{O}_3$  0.05,  $\text{CaO}$  0.257. These results are discussed at length and synthetic expts. were made in an attempt to imitate some of the conditions under which the embalming probably took place. The final conclusions are that the Hg was employed in the metallic state as a "balsamo-mercurial unguent."

L. W. RIGGS.

**Trade in cinchona bark.** ANON. *Bull. Imp. Inst.* 16, 370-88(1918).—This is for the most part an article on the future of the trade in cinchona bark and is largely of economic interest. Two samples of the bark from St. Helena are described in detail and analyses are given of bark as received and of moisture-free bark. The total alkaloid (dry bark) was 9.2 and 9.3%. The yield of crystd. quinine sulfate was 9.1 and 5.1%, which are equiv. to 6.7 and 3.7% of anhydrous quinine. Analyses of 4 samples from East Africa also are reported. One of these (*Hybrid Cinchona ledgeriana* x *C. succirubra*) contained 8.41% quinine. There was no cinchonidine present.

R. L. SIBLEY.

**Strophanthus seeds and the galenical preparations made therefrom.** J. BLOMBERG, JR. *The Hague. Pharm. Weekblad* 55, 1587-97(1918).—The seeds of 3 distinct varieties of *Strophanthus* (*S. kombé*, *S. hispidus* and *S. gratus*) are used in pharmacy. There is considerable confusion among various pharmacopeias, chiefly between *S. Kombé* and *S. hispidus*. All three are used by African natives as arrow poisons, owing to their heart action. Unless fat-free, the seeds yield a tincture which causes diarrhea; yet only the U. S. P. IX and the Brit. Pharm. of 1914 require fat extn. before making the tincture. The seeds contain 35-45% of fat and are difficult to powder; the coarse powder from the 1st extn. must be dried, ground and extd. a 2nd time to ensure complete extn. Dry  $\text{Et}_2\text{O}$  or a high or low boiling petroleum ether may be used without affecting the strophanthin content. The color test for strophanthin with  $\text{H}_2\text{SO}_4$  is best carried out by dilg. the tincture with 10 vols. of  $\text{H}_2\text{O}$  and testing with 75%  $\text{H}_2\text{SO}_4$  at room temp. The inversion of strophanthin to insol. strophanthidin by acids can be used as a qual. or as a quant. test. The wt. of the residue after drying tincture of strophanthin varies so much that it is impractical to demand conformity to any standard in this respect. Though the tincture has no diuretic properties, the aq. ext. of *S. kombé* seeds is strongly diuretic. This is due to a mixt. of 2 saponins, of which 1 is acid and 1 is neutral. This aq. ext. has therapeutic value and deserves thorough clinical study. The aq.-alc. ext., given in conjunction with dionine or belladonna, gives results in some heart diseases which can be obtained in no other way.

JULIAN F. SMITH.

**Iodized chloroform in war surgery.** A. CHASSEVANT. *Union pharm.* 1918, 26; *Schweis. Apoth. Ztg.* 56, 581-3(1918).—A (violet) soln. of I 1 g., in  $\text{CHCl}_3$  30 g. is antiseptic without being caustic, and should replace the brown I solns., especially tincture of I, which are caustic and produce necrosis of the living cells. The  $\text{CHCl}_3$  soln. of I is useful in treating furunculosis and anthrax, suppurating wounds, burns, varicose ulcers and may be used as a prophylactic in diphtheria and cerebrospinal meningitis, since it is well supported by the mucous membranes. In wound treatment, use a protective dressing consisting of a mixt. of paraffin, white wax and spermaceti, equal wts., previously warmed to 50°.

S. WALDBOTT.

**Opium cultivation in South Serbia.** J. FRUSCHKOOGORAZ. *Schweis. Apoth. Ztg.* 56, 593-4(1918).—The greater part of "Salonichi opium" (C. A. 12, 2655) is cultivated in South Serbia. The best yield per hectare is 16 kg. In 1915 the total production was 125,000 kg.

S. WALDBOTT.

**A substitute for castor oil.** ANON. *Pharm. J.* 101, 95(1918).—"Oil of cavele," obtained from *Omphalea megacarpa* growing in Brazil, is suggested as a substitute. It has a straw color and a slight, not unpleasant odor. It also has diuretic properties, is non-irritant, and its cathartic activity does not decrease with age. Its chem. const. differ widely from those of castor oil. It is optically inactive not, viscous, and only slightly sol. in  $\text{EtOH}$ .

S. WALDBOTT.

**New method of extraction of alkaloids.** L. REUTTER. *Schweis. Apoth. Ztg.* 56, 668-71(1918).—The method consists in replacing the strong mineral acids by  $\text{AcOH}$ , citric, tartaric, oxalic or  $\beta$ -naphthalenesulfonic acids. *General procedure:* Treat 50 g. of the powdered drug with 200 g. of boiling  $\text{H}_2\text{O}$  containing 5 g. of the acid, filter hot, decant from the sepd. oil or resin, ext. remaining traces with  $\text{Et}_2\text{O}$  or petroleum ether, evap. the soln. to small bulk and ppt. the alkaloid by a suitable base. Redissolve and isolate the pure alkaloid by usual methods. Analytical results of the examn. of 26 drugs with each of the 5 acids are tabulated; close agreement is shown.

S. W.

**Ripe and unripe poppy capsules.** ZÖRNIG. *Schweis. Apoth. Ztg.* 56, 549-53(1918).—The use of "tea" from finely cut, ripe poppy capsules for small children is to be condemned, because alkaloids are still present in ripe capsules (C. A. 2, 886), and unripe fragments may be present. The ripe and unripe may be distinguished by the microscope (C. A. 8, 1641). The article should be eliminated from all, including the Swiss, pharmacopeias.

S. WALDBOTT.

**The seeds of *Ilex paraguariensis* St. Hilaire.** A. LENDNER. Geneva. *Schweis. Apoth. Ztg.* 56, 565-9(1918).—Germination expts. made on seeds brought by Chodat from Argentine in 1914 were but partly successful. The fruits, seeds and process of germination are described, also the structural characters involved (cf. C. A. 6, 2120). The seeds contained  $\text{H}_2\text{O}$  7.06, fatty matter 16.18, caffeine 0.17% by Burmann's method (C. A. 4, 1711; 5, 1949). Microsublimation readily shows the presence of caffeine.

S. WALDBOTT.

**"Ghassoul."** E. WILCZEK. *Schweis. Apoth. Ztg.* 56, 521-2(1918).—An Abyssinian drug, consisting of a coarse powder mixed with stems and ripe fruits of an undetd. species of *Mesembrianthemum*, and claimed to be a substitute for soap. Seeds from the fruits were planted in Geneva and Lausanne, and produced vigorous plants of *M. nodiflorum* and *M. crystallinum*. The chem. properties were not detd.

S. WALDBOTT.

**The deterioration of tincture of digitalis.** P. S. PITTENGER. *J. Am. Pharm. Assoc.* 7, 1031-4(1918); cf. C. A. 12, 1105.—During a storage period of from 9 to 13 mo., 43 samples were tested at intervals. The av. loss was 18.8%. The av. deterioration of 38 samples during the first 3 or 4 mo. was 4% per mo. The av. deterioration

of 32 samples after the first 3 or 4 mo. was 2.4% per mo. The rate of loss varies greatly with different lots, some deteriorating very rapidly and a few apparently not at all.

L. E. WARREN.

The conservation of crude drugs. H. H. SCHAEFER. *J. Am. Pharm. Assoc.* 7, 1049-52(1918).—A discussion.

L. E. WARREN.

Problems of the manufacturing pharmacist directly resulting from war conditions. C. H. BRIGGS. *J. Am. Pharm. Assoc.* 7, 1047-9(1918).—A discussion.

L. E. WARREN.

Problems of the manufacturer of medicinal chemicals directly resulting from war conditions. B. L. MURRAY. *J. Am. Pharm. Assoc.* 7, 1042-6(1918).—A discussion.

L. E. WARREN.

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Cinchona alkaloids (GIEMSA, HALBERKANN) 10.

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## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The progress of applied chemistry in Great Britain during the war. RICHARD B. PILCHER AND FRANK BUTLER-JONES. *Rev. chim. ind.* 27, 214-9(1918).

E. H.

Report of the Patent Committee to the National Research Council. L. H. BAEKELAND, *et al.* *J. Ind. Eng. Chem.* 11, 250-3(1919).—Reforms are recommended.

E. J. C.

The needs of the U. S. Patent Office. THOMAS EWING. *J. Ind. Eng. Chem.* 11, 237-9(1919).—An address.

E. J. C.

More detailed statistics of chemical commodities. *J. Ind. Eng. Chem.* 11, 257-63(1919).—Part of a detailed report of a Committee on Reclassification of Commodities Imported and Exported made up of representatives of the Bur. of Foreign and Domestic Commerce, the Census of Manufactures, the Treasury, the Shipping Board, the Tariff Commission and the War Trade Board. Besides the main groupings in the classification there is given the classification of the main grouping "8-Chemicals and Chemical Products."

E. J. C.

Manufacture of hydrocyanic acid. H. A. PELTON AND M. W. SWARTZ. *Chem. Met. Eng.* 20, 165-6(1919).—An exptl. installation is described. A 35% aq. soln. of NaCN is run into an excess of 39° Bé H<sub>2</sub>SO<sub>4</sub> in a steam-jacketed reaction kettle provided with an agitator. The temp. is allowed to rise to 70° while the cyanide is being run in, and the mixt. is then brought to boiling. HCN and water vapor are distd. off, the latter being returned to the reaction kettle by a reflux condenser cooled with ice. The HCN passes through and is liquefied in a second condenser cooled with ice, and collected in cold steel cylinders. The product should be 90-95% pure. An av. yield of 78% of the theoretical is obtained, at an approx. total cost of \$1.074 per lb. of HCN produced.

E. M. BAKER.

Some observations on sulfuric acid plants (new and old). VI. "P." *Gas World* 69 (Coking and By-products Sec.), No. 1785, 14-5(1918); cf. *C. A.* 12, 2429.—The combustion of spent oxide is effected either in burners operated by hand or mechanically. The advantages of the former are: (1) Absence of mechanical defects, (2) the burned oxide contains a larger proportion of sol. Fe salts, which favors its reuse for gas purification, (3) water-white acid can be produced, owing to the absence of dust, (4) saving of initial capital outlay, (5) no necessity to screen the spent oxide. The advantages of the latter are: (1) greater regularity in compn. of gas. (2) S more effectually removed by combustion. The costs of operation of either type are almost

identical. Four types of hand-operated burners are diagrammed and the methods of working described. J. L. WILBY.

**Future of the barium industry.** WM. H. ROLLIN. *Chem. Met. Eng.* 20, 163-4 (1919).—To put the infant Ba industry on a sound commercial basis will require a protective tariff, reduced freight rates, and the right of producers to organize.

E. M. BAKER.

**Sodium salts in 1917.** ROGER C. WELLS. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part II, 305-41 (preprint No. 23, published Jan. 27, 1919). E. H.

**Potash content of blast-furnace charges.** N. H. GILLERT. *Iron Age* 103, 355-6 (1919).—The Fe ores ordinarily used in blast-furnaces in the U. S. contain from 0.29 to 2.07%  $K_2O$ . It is believed, however, that most of the Lake ores do not run over 0.3%. Foreign ores run high in potash, none of the Brazilian ores examd. containing less than 1%  $K_2O$ . The Alabama ores are comparatively rich in potash, even the brown ores running as high as 1.5%  $K_2O$ , while it is known that the gray hematites of this region run between 1 and 3%, although the latter have not yet been used extensively in furnaces. The cokes examd. run between 0.078 and 0.2%  $K_2O$ , while the limestone seems to run between 0.36 and 0.41%. Although the  $K_2O$  content of the burden may vary from a very small amt. to a comparatively large amt., the total quantity contained in the charge during 24 hrs. operation is considerable. It is computed that in 1915 there was charged into the blast furnaces of the U. S. about 305,000 tons of  $K_2O$ . The max. annual consumption of potash for the period 1905-14 was 279,780 net tons, in 1910, while the average amt. was 198,636 tons. The figures given for the possible potash supply from blast furnaces are based on the lowest content actually found. A much larger amt. is probably actually charged. It is believed that between 40 and 50% of the potash charged can be recovered. The device that can most successfully collect it is the Cottrell elec. precipitator. Expts. on a semi-commercial scale indicate that such a collection is possible.

A. L. FIELD.

**Potash discovery in Sicily.** ANON. *J. Ind. Eng. Chem.* 11, 246(1919).—It is reported that rich potash deposits have been found in the province of Cattanisetta, Sicily.

E. J. C.

**The present status of nitrogen fixation.** ALFRED H. WHITE. *J. Ind. Eng. Chem.* 11, 231-7(1919).—An address.

E. J. C.

**American sulfur industry expanding.** ANON. *Chem. Met. Eng.* 20, 186-8(1919).—The Texas Gulf Sulphur Co. is erecting a plant to mine sulfur under the Frasch patents from the Matagorda dome (Texas). Production of 1000 tons daily should start in April. The S is melted and forced to the surface by pumping down water at 163°. The fuel efficiency is less than 3%, based on the heat necessary to melt the S. Oil-fired boilers are used; about 2000 barrels of fuel oil and 4,000,000 gal. of feed water are required daily. The equipment of boilers, pumps, etc. is described.

E. M. BAKER.

**Preparation of crucible graphite.** G. D. DUB. *Bur. Mines War Minerals Invest. Ser.* 1918, No. 3, 24 pp.—A detailed description, with numerous figures, flow sheets, analytical and other data, of graphite investigations made by the Bureau in connection with the war minerals investigations. The establishment of a permanent domestic industry is discussed; the methods used in the Alabama, New York, Pennsylvania, and Texas fields, and the recovery of graphite from "kish" are described in detail; exptl. work on concn. and refining and on crucible manuf. are briefly outlined. Methods of sampling and of analysis (detn. of moisture, volatile matter, ash, and graphitic C by difference) are described. As a tentative specification for No. 1 flake graphite, it is recommended: (1) that the graphitic C content be not less than 85% (by graphitic

C is tentatively meant the C remaining after the dried sample has been burned in a covered crucible for 3 min. at 800°); (2) that the screen analysis show (figures represent cumulative %) over 35 standard mesh, 3; over 65 standard mesh, 50; over 100 standard mesh, 100. Results reported of complete analysis of 6 samples of domestic and 1 sample of Ceylon graphite indicate that the amt. of deleterious impurities in domestic flake graphite is small. Taking the sample of Ceylon graphite as a criterion, chemically, domestic graphite compares favorably with same. The report concludes with a discussion of the present status of the graphite-mining industry. F. W. SMITHER.

**British Admiralty hydrogen gas plant.** ANON. *Engineering* 107, 103(1919). —The plant operates the Jaubert process, which consists in the decompn. of Si alloys obtained in the elec. furnace, such as ferro-, or mangano-silicon, or even spiegel, by a 35 to 40% NaOH soln. The alkali soln. having a high b. p., all of the heat generated by the reaction in the combination of the Si with the alkali is retained in the soln. itself, thus doing away with external heating. The operation of the plant is as follows: To H<sub>2</sub>O contained in a vat, 1.5 to 2 times its wt. of soda is added, dissolution being aided by means of a stirring device. The heat generated raises the temp. of the soln. to 60 to 80°. The soln. is then run into the gas generator, which it should reach at a temp. sufficient to start the reaction on contact with the Si alloy. The "planetary stirrer" causes the alloy powder falling from the hopper-shaped receiver to come into intimate contact with the NaOH soln., and prevents it from accumulating in the center of the generator. The H gas, which is evolved at a high temp., flows into a scrubber condenser, and thence through a pipe line for utilization. The first set of app. installed yielded 60,035 cu. ft. H per hr. H. JERMAIN CREIGHTON.

ROUET, H. AND COTTO, F.: *Le controle technique a l'usine, a l'usage des controleurs, controleurs et ouvriers. Métaux.* Paris: H. Dunod et E. Pinat. 101 pp.

**Concentrating sulfuric acid.** H. V. WELCH. U. S. 1,289,984, Dec. 31. The method described is adapted for the concn. of the dil. H<sub>2</sub>SO<sub>4</sub> resulting from the manuf. of nitrocellulose and nitroglycerin or of dil. chamber acid produced in the manuf. of H<sub>2</sub>SO<sub>4</sub> by the chamber process. All of the dil. acid is converted into the vapor phase and then by cooling to a certain detd. degree a cloud of acid of definite strength is formed and the particles of this cloud are collected by elec. pptn. The temps. of cooling and the corresponding strengths of acid obtained are: 260–280° for 90% acid; 200–210° for 80% acid and 165–175° for 70% acid. Solns. containing HCl as well as H<sub>2</sub>SO<sub>4</sub> and H<sub>2</sub>O may be similarly treated to obtain H<sub>2</sub>SO<sub>4</sub> of a desired concn. Practically complete recovery of the acid is effected.

**Burning sulfur.** G. F. HURT. U. S. 1,289,783, Dec. 31. In burning S for the manuf. of SO<sub>2</sub> for making H<sub>2</sub>SO<sub>4</sub>, a pool of molten S is maintained in the burner and as the S in the pool is burned its combustion is facilitated by spraying a portion of the molten S upward from the pool into an atm. which will support its combustion. The pat. illustrates and describes an app. for carrying out this method.

**Dehydrating chlorides of rare earth metals.** C. W. BALKE. U. S. 1,289,079, Dec. 31. Anhydrous chlorides of rare earth metals are prepd. by adding NH<sub>4</sub>Cl to a soln. of the rare earth chlorides, crystg. out the mixed chlorides, evapg. to dryness and slowly raising the temp. to a dull red heat in the presence of a current of HCl until all the NH<sub>4</sub>Cl has been driven off.

**Thorium salts.** LINDSAY LIGHT CO. Brit. 117,438, Nov. 26, 1917. Monazite sand is heated with strong H<sub>2</sub>SO<sub>4</sub>, a temp. of 175° being mentioned, to convert the Th and rare earths into sol. form, and the heating is then raised to 250–300° until the Th

alone has become insol. The mass is then cooled and stirred with  $H_2O$  and the insol. Th pyrophosphate in cryst. form is filtered off and may be further treated to obtain pure Th compds. It is claimed also that pure thorium pyrophosphate in this form may be made by heating Th sulfate and  $H_3PO_4$  at  $280^\circ$ .

**Freeing liquids from suspended particles.** V. M. GOLDSCHMIDT. Can. 188,808, Feb. 25, 1919. Solns. of salts of Fe and Ti are freed from suspended solid particles by pptg. S in the liquid and removing the solid particles. The pptn. may be accomplished by the oxidation of  $H_2S$  by means of a ferric salt. Cf. C. A. 12, 2114.

**Clarifying liquids.** TITAN CO. Brit. 121,457, Oct. 31, 1918. To assist the deposition of finely divided solids suspended in liquids, a ppt. of S is formed in the liquid which in settling brings down the suspended solid. The invention is particularly described with reference to removing hydrated  $SiO_2$  from a soln. containing ferrous and ferric sulfates and Ti sulfate, and it is suggested that the action is in part due to the electropositive and electronegative conditions of the  $SiO_2$  and the S, respectively. The S may be introduced as  $H_2S$ , which is oxidized in the liquid described by the  $Fe_2(SO_4)_3$ , but oxidizing reagents may be added when necessary.

**Recovering potassium compounds from silicates.** A. GRAUEL. U. S. 1,289,736, Dec. 31. Fumes from feldspar or similar silicates containing K, produced by heating the mineral silicate with  $CaCl_2$  or  $CaSO_4$  (depending on whether KCl or  $K_2SO_4$  is desired) are absorbed in a soln. which is preheated and maintained under pressure to facilitate the absorption and vapors from the absorption liquid are condensed to avoid loss.

**Apparatus for recovering potassium compounds from smoke and ash of vegetable materials.** H. M. HINER. U. S. 1,290,194, Jan. 7. Cotton bolls, hardwood sawdust or other vegetable materials may be burned in the app. to obtain K compds.

**Absorption of carbon dioxide from gaseous mixtures.** J. C. H. KRAMERS. U. S. 1,290,244, Jan. 7.  $CO_2$  from gaseous mixts. is absorbed in a soln. containing  $Na_2CO_3$  together with other salts such as NaCl or  $NaNO_3$  which raise the b. p. of the soln. and mixed with a sludge of  $MgCO_3$  or basic carbonates of Mg which improves the ability of the mixt. to absorb  $CO_2$ . The latter is recovered from the soln. by heating and the soln. may then be reused for absorbing additional  $CO_2$ .

**Apparatus for obtaining nitrogen and carbon dioxide from combustion gases.** C. D. McCOURT and C. ELLIS. U. S. 1,289,496, Dec. 31. An explosive mixt. of fuel gas and air is burned by surface combustion in a bed of refractory material in a boiler furnace, the gas and air being used in approx. combining proportions. Combustion gases from the furnace are led to an "economizer" wherein they are cooled and thence to an absorption device where the  $CO_2$  is taken up by carbonate liquor. Carbonate liquor from the absorption app. is passed through the economizer to preheat it and then to the boiler where the  $CO_2$  is driven off from the liquor. N in the decarbonated gas may be purified and converted into cyanamide.

**Drying precipitates, etc.** A. F. LAURIE. Brit. 121,372, Dec. 29, 1917. Materials pptd. or deposited from suspension in liquids are submitted to a low temp. to freeze the liquid content, and, during thawing the superfluous  $H_2O$  is removed by draining, by a vacuum filter, or by other means. The process is stated to be applicable to ppts. of a gelatinous character, ochres, chrome and Cd yellow, Prussian blue, and other pigments.

**Sulfur-burner.** H. C. ELLIS. U. S. 1,289,417, Dec. 31. The pat. relates to structural features of a S-burner built of reinforced concrete and fire-brick. It is especially intended for making  $SO_2$  to bleach grain.

**Pitch in filament form.** R. P. PERRY. U. S. 1,289,892, Dec. 31. Pitch is converted into filament form by placing molten pitch in a centrifugal machine with per-

forated walls and regulating the temp. of the pitch and the speed of the machine so that filaments of pitch extrude through the perforations of the walls. The pitch filaments may be coated with powdered soapstone to render them non-adherent and are suitable for use in making felted heat-insulating or packing material.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**The presence of iron in the furnace atmosphere as a source of color in the manufacture of optical glass.** EDWARD W. WASHBURN. *J. Am. Ceram. Soc.* 1, 637-9 (1918).—It was first noticed that a heavy flint glass ( $n_D = 1.64$ ) was colorless when melted in an elec. furnace but decidedly greenish when melted in a gas furnace in the lab. Gas samples taken in a large furnace and directly over the pot distinctly showed the presence of Fe. Stirring the glass hastened the Fe contamination. The sources of Fe are chiefly (1) burners, (2) impurity in fire bricks. Using clay burners and coating the inside of the furnace wall with kaolin gave distinct improvement in color.

C. H. KERR.

**The effect of certain impurities in causing milkiness in optical glass.** Discussion by F. GELSTHARP of paper by C. N. FENNER AND J. B. FERGUSON. *J. Am. Ceram. Soc.* 1, 559-66 (1918); cf. *C. A.* 13, 368.—At Pittsburgh Plate Glass Co. the only glasses that showed milkiness were the borosilicate crown and dense flint. Impure  $K_2CO_3$  was not the cause because pure  $KNO_3$  was used. In the ordinary Na-Ca glasses milkiness may always be cured by a slight increase in alkali content. Milkiness in the optical glasses is also ascribed to deficiency in alkali due perhaps to volatilization under improper melting conditions. *Reply by Fenner and Ferguson:* Calculation and expts. relating to the optical glasses showed that conditions most favoring deficiency of alkali tended to lessen rather than increase milkiness. Curing milkiness by higher temps. also tends to refute Gelstharp. Final proof, however, is not claimed.

C. H. KERR.

**Expansion of glass in connection with its optical and thermal properties.** Masamichi So. *Proc. Tokyo Math. Phys. Soc.* [2] 9, 426-41 (1918).—A newly drawn and unannealed thin glass thread contracts in a longitudinal direction at a temperature just below that at which the glass becomes plastic. This is thought to be due to recovery from the strain. Heat is absorbed by the glass on reaching its plastic state. This is independent of any strain, and seems to be a phenomenon associated with the melting of one of the glass constituents. The electric resistance of glass falls logarithmically within a temperature range below its plastic state. This temperature range is lower than that at which the other two phenomena take place. F. P. PHELPS.

**Notes on the "Sang de Boeuf" and the copper-red Chinese glazes.** J. N. COLLIE. *Trans. Eng. Ceram. Soc.* 17, 379-84 (1918); cf. *C. A.* 11, 92.—It is impossible to say whether the red color of reduced Cu is due to a cuprous silicate or to colloidal Cu. The amt. of Cu in the Sang de Boeuf glaze is very small, probably under 1% CuO. There is somewhat more  $Fe_2O_3$ . Phosphates are absent and the glaze is the ordinary feldspathic glaze containing  $SiO_2$ ,  $Al_2O_3$ , CaO and alkali. Other types of copper reds were also made fully as brilliant as the best Sang de Boeuf but opaque. These are Pb glasses and glazes. A Roman Egyptian glass showed on analysis:  $SiO_2$  38.20, PbO 31.10, CuO 4.67,  $Al_2O_3 + Fe_2O_3$  2.10, MnO 0.10, CaO 8.15,  $K_2O$  0.61,  $Na_2O$  10.29,  $SnO_2$  0.70. An early Ming Chinese vase showed the following approximate analysis: PbO 28, CuO 2,  $Fe_2O_3$  2,  $P_2O_5$  trace. The historical descriptions are of great interest.

C. H. KERR.

**The control of luster in enamels.** HOMER F. STALEY. *J. Am. Ceram. Soc.* 1, 640-7 (1918).—Control of luster is very largely a control of crystn. Luster is helped

by increase in viscosity which is accomplished by increasing  $\text{SiO}_2$ , feldspar,  $\text{B}_2\text{O}_3$ , kaolin or any material which does not fuse or go into soln. in the enamel, or by decreasing fluxing oxides (except  $\text{B}_2\text{O}_3$ ) or fluorides. Since increase in concn. of any crystallizable material will obviously increase mattness, a decrease will help luster. Any delay in the enameling operation tends to spoil luster. S compds. especially from furnace gases are fatal to good luster. Materials of high  $n$  are obviously the more brilliant.

C. H. KERR.

A method for the graphic determination of quaternary mixtures. HORACE S. NEWMAN. *Trans. Eng. Ceram. Soc.* 17, 336-9(1918).—Pottery compns. usually contain ball clay, china clay, Cornish stone and flint and if only 3 variables are used an arbitrary relation of ball clay to china clay must be set. The variation in percentages of the 4 ingredients is shown on a square. For illustration, a square is divided into 25 smaller squares. At the top left corner, ball clay = 10 and decreases across the top, 8, 6, 4, 2 and 0 at each smaller square. In the same way, Cornish stone starts at 10 at the top right corner and decreases down the right edge, 8, 6, 4, 2 and 0. China clay starts at the bottom right corner (= 10) and decreases across the bottom, 8, 6, 4, 2 and 0. Flint starts at the bottom left corner (= 10) and decreases up the left edge, 8, 6, 4, 2 and 0. Any point then by reading across to the 4 edges (and multiplying each figure by 5) shows the % of each of the 4 ingredients. The limitations are (1) no mixt. with over 50% of any one ingredient can be shown but this limitation is not often important in pottery mixes, (2) no mixt. represented by opposite corners only can be shown. Examples are given.

C. H. KERR.

Some types of porcelain. F. H. RIDDLE AND W. W. McDANIEL. *J. Am. Ceram. Soc.* 1, 606-27(1918).—The object was to det. the burning range of porcelain bodies fired at or above cone 10 and having compns. covering the ordinary porcelain field. The range of mixts. is shown in the table.

| Clay %. | Feldspar %. | Whiting %. | Flint %. |
|---------|-------------|------------|----------|
| 45      | 16-30       | ...        | 39-25    |
| 50      | 16-30       | ...        | 34-20    |
| 55      | 14.5-28.5   | 1.5        | 29-15    |
| 60      | 14.5-28.5   | 1.5        | 24-10    |
| 70      | 10-28.5     | 1.5        | 18.5-0   |
| 75      | 10-23.5     | 1.5        | 13.5-0   |
| 80      | 10-18.5     | 1.5        | 8.5-9    |
| 85      | 13.5        | 1.5        | 0        |

The clay content was equal parts Georgia, Florida, N. Carolina, and Delaware kaolins. Where clay exceeded 55% the balance was calcined to cone 14 and dry ground to 120 mesh. Burning range was not much wider for low-feldspar than for high-feldspar bodies. The higher the clay content the less the effect of variations in flux. Results are discussed in detail. In a second series of mixts. the effect of ball clay was studied. As little as possible should be used. Adding small amts. (up to 1%  $\text{BaO}$ ) of  $\text{BaCO}_3$  had almost no effect.  $\text{CaO}$  assisted in vitrification but hastened overburning,  $\text{MgO}$  or dolomite was beneficial. Replacing quartz by a  $\text{SiO}_2$  equiv. of sillimanite made a good body, particularly where low coeff. expansion was desired. White color is secured by (1) using very pure material, (2) burning under reducing conditions, and (3) masking the yellow color by a blue stain.

C. H. KERR.

The standardization of tests for refractory materials. (Part I.) J. W. MELLOR. *Trans. Eng. Ceram. Soc.* 17, 300-30(1918); COSMO JOHNS, *Engineering* 106, 540-2, 569-72(1918).—An outline of a committee report on provisional specification governing methods of testing. 1. The analysis of fireclays, raw ganisters, quartzose rocks and manufactured products: Methods for hygroscopic  $\text{H}_2\text{O}$ , ignition loss,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ .



$\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{CaO}$ ,  $\text{MgO}$ , and alkali are given in detail. *II. Analysis of dolomite and magnesite:* Methods are given for hygroscopic  $\text{H}_2\text{O}$ , ignition loss, alkali,  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{TiO}_2$ , P and S. *III. The identification of the various forms of  $\text{SiO}_2$  in  $\text{SiO}_2$  bricks:* Either thin sections or powders may be used; thin sections are best for study of cryst. form and habit. Optical characteristics and distinctions are discussed in detail. *IV. Porosity,  $\text{H}_2\text{O}$  absorption and sp. gr.:* For porosity detn. a 2" cube is dried at  $110^\circ$  for 2 hrs., soaked for several hrs., preferably overnight, in  $\text{H}_2\text{O}$  under reduced pressure and porosity is expressed as vol. % of the whole piece. With very dense pieces soaking must be continued several days to get duplicates to agree within 0.2% as required. Apparent sp. gr. is calcd. from the same data and real sp. gr. of powder detd. as usual. *V. Shrinkage in drying and burning:* Specimens  $4\frac{1}{2}" \times 1\frac{1}{8}" \times \frac{9}{16}"$  are dried at  $70-80^\circ$  for 4-5 hrs., and finally at  $110^\circ$ . Drying shrinkage is based on wet length. Burning rate should be not over 100° per hr. up to  $900^\circ$  and 200° per hr. above  $900^\circ$ . Burning shrinkage is expressed in terms of both wet and dry lengths. *VI. Tensile strength of dried clays:* The ordinary cement briquet shape is used and specimens are broken in the usual cement-testing machines. *VII. After-contraction or after-expansion:* Temps. of  $1410^\circ$  for firebricks and materials with under 80%  $\text{SiO}_2$  and  $1350^\circ$  for refractories with over 80%  $\text{SiO}_2$  are standard, and these temps. are held for 2 hrs. *VIII. Normal refractoriness:* A piece chipped to Seger cone shape and fused in a Hirsch or similar elec. furnace and compared with standard cones. Heating rate should be  $50^\circ$  per 5 min. until the first cone melts and  $20^\circ$  per 5 min. until the end. *IX. Load test:* Test pieces  $2" \times 2" \times 3\frac{1}{8}"$  are cut from bricks and tested on end in a furnace with lever attachment to apply load. The furnace is described in detail but the test is not. *X. Thermal expansion:* The Coppée app. is used, consisting of a horizontal cathetometer, with standard metric scale and a suitable furnace. Saw cuts are made in the edge of a standard brick,  $\frac{1}{8}"$  from each end and Pt wire with pointed ends inserted as measuring indices. Standard temps. are not given. *XI. Crushing strength cold:* The usual compression testing machines are suitable.

C. H. KERR.

Effect of load on the refractoriness of firebricks. J. W. MELLOR AND W. EMERY. *Trans. Eng. Ceram. Soc.* 17, 360-71(1918).—See C. A. 12, 2118.

C. H. KERR.

Report of committee C-8 on refractories. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 287-92(1918).—A revision of details in the tentative method for ultimate chem. analysis given (cf. C. A. 12, 793). Load test method is also somewhat revized (cf. C. A., 12, 858), the chief changes being in substitution of a larger furnace testing 2 bricks at once and in the rate of heating of both  $\text{SiO}_2$  and clay bricks in the test.

C. H. KERR.

Tentative test for refractory materials under load at high temperatures. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 573-7(1918).—Revision of former outline (cf. C. A. 12, 858 and preceding abstract).

C. H. K.

Tentative methods for the ultimate chemical analysis of refractory materials. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 580-7(1918); cf. C. A. 12, 793, and 2nd abstract above.

C. H. KERR.

Refractory products. A. MALINOVSKY. *Chem. Met. Eng.* 19, 768-9(1918).—A general description of various types of refractories and an argument for the work of the Am. Ceram. Soc.

C. H. KERR.

Tentative test for slagging action of refractory materials. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 578-9(1918).—Drill cavities 2.5" diam.  $\times$  0.5" deep on the face of regular bricks. The standard slag (new compns. have since been decided upon) is ground to 40 mesh. The brick is heated in 5 hrs. or more to  $1350^\circ$ , 35 g. of slag

introduced and 1350° held for 2 hrs. Penetration is measured by a planimeter.

C. H. KERR.

**Refractories used in steel production.** ALLEYNE REYNOLDS. *Trans. Eng. Ceram. Soc.* 17, 385-458(1918).—A review of the various conditions surrounding the use of refractories in steel making and of the refractories used.

C. H. KERR.

**The constitution of silica bricks.** ALEXANDER SCOTT. *Trans. Eng. Ceram. Soc.* 17, 459-74(1918).—Impurity in raw material should be low, preferably under 5-6%. Requisite properties of good quartz rock are: (1) high  $\text{SiO}_2$  content, (2) presence of an amt. of impurity sufficient to accelerate quartz conversion but insufficient appreciably to lower the m. p., (3) structure that will give angular fragments on crushing. The structure of the original rock exerts a strong influence on cryst. conversion. A brick of which the hot end had been at about 1550° for many months showed the following percentages of (a) quartz, (b) cristobalite, (c) glass and (d) tridymite at the given distances from the hot end: 1 cm. (a) 0, (b) 1.9, (c) 6.7, (d) 91.4; at 12.5 cm. (a) 10.8, (b) + (c) 59.0, (d) 30.2; at 20 cm. (a) 20.4, (b) + (c) 71.1, (d) 8.5. In the cooler parts the material is mainly cristobalite. Evidence tends to prove that tridymite is the stable form up to 1550° at least. A piece of brick which was all tridymite was held for 2 weeks at 1530° and quenched. The tridymite was unchanged. Contamination of bricks during use may considerably alter the changes. In steel furnaces the roof bricks show the following zones: (1) a gray zone—the hottest end—showing very little trace of the original rock, (2) a black zone about 4-6 cm. deep partly structureless but showing some traces of the original fragments, (3) a broad band (7-10 cm.) of pale colored materials resembling the original mass but less distinct and (4) a red (cool) end with the extreme end unaltered. These parts are well described.

C. H. K.

**Silica products. I. Raw materials.** A. BIGOT. *Trans. Eng. Ceram. Soc.* 17, 259-66(1918).— $\text{SiO}_2$  bricks from the frieze of archers of the palace of Darius (at the Louvre) were made from quartz sand with a lime binder. Analysis showed:  $\text{SiO}_2$  89.10,  $\text{CaO}$  5.05,  $\text{MgO}$  0.62,  $\text{Al}_2\text{O}_3$  2.10,  $\text{Fe}_2\text{O}_3$  2.80. Some historical data are given, also methods and general data regarding the study of the raw materials by analytical, physical and microscopic methods.

C. H. KERR.

**The necessity for inspection and testing of refractory brick.** C. E. NESBITT AND M. L. BELL. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 336-48(1918).—Specifications for refractory bricks specify nothing of importance. Tests must be rapid and show fitness for the particular use intended. For testing  $\text{SiO}_2$  brick for steel works use, tests of slag action, spalling and hot crushing are sufficient, while for clay brick, load, spalling and slagging tests are needed. Visual inspection is of utmost importance. In a tabulation of results in the spalling test on 5 successive shipments of one brand of  $\text{SiO}_2$  brick the loss varied from 11.72 to 40.80% in one lot and from 13.39 to 43.37% in another lot while av. for all shipments was about 25%. Similar variations are shown in the crushing and slag-penetration tests. Excellent pictures are shown.

C. H. KERR.

**Note on the microstructure of magnesite bricks.** ALEXANDER SCOTT. *Trans. Eng. Ceram. Soc.* 17, 475-85(1918).—In magnesite bricks there are two distinct types and gradations between these. In the first,  $\text{MgO}$  occurs as sharply defined polygonal crystals of periclase which form a reticulate aggregate. In the second type, the  $\text{MgO}$  appears as small, rounded crystals in a matrix usually crystalline. The first is found in bricks with  $\text{Fe}_2\text{O}_3$  as the main impurity while the second is more common where appreciable quantities of  $\text{CaO}$  and  $\text{SiO}_2$  are present.

C. H. KERR.

**Tentative methods for determining porosity and permanent volume change in refractory materials.** ANON. *Proc. Am. Soc. Testing Materials* 18, 588-91(1918).—

Test pieces  $2.5 \times 2.5 \times 1.25$ " are cut from standard bricks. Specimens are burned and trials drawn at each  $50^\circ$  interval from 1200 to  $1500^\circ$ . Tests are made in kerosene and under a vacuum of 24" for 24 hrs. at  $250^\circ$ . Calcns. of exterior vol., open pores, apparent sp. gr., true sp. gr., sealed pores and vol. shrinkage are shown. C. H. K.

**The new refractory and abrasive matter called corindite.** ALEXANDRE BIGOT. *Trans. Eng. Ceram. Soc.* 17, 267-70(1918); cf. C. A. 12, 2242.—Both the red and the white bauxite of southern France are fused by the Lecesne process (cf. C. A. 11, 1022, 2838; 12, 1240, 1591). Typical analyses of corindite prepared from (a) white bauxite and (b) red bauxite are:  $Al_2O_3$  (a) 68.80, (b) 69.25;  $TiO_2$  (a) 3.85, (b) 3.70;  $SiO_2$  (a) 21.40, (b) 3.00;  $Fe_2O_3$  (a) 5.25, (b) 23.35; C (a) 0.60, (b) 0.50; ign. loss (a) 0.10, (b) 0.15. The white is exceedingly refractory and the red is a good abrasive.

C. H. KERR.

**Tentative specifications for clay sewer pipe.** *Proc. Am. Soc. Testing Materials* 18, Pt. I, 542-54(1918)—Any special chem. requirements shall be stated in advance. Phys. tests shall include crushing, hydrostatic pressure and absorption. Over 20% failure of tested pieces shall cause rejection. Details of the tests are given. Sizes, with permissible variations are tabulated. Crushing strength must be 1430 lbs. per linear ft. for 6" internal diam. pipe, 1430 for 8", 1570 for 10", 1710 for 12", 1960 for 15", 2200 for 18", 2590 for 21", 3070 for 24", 3370 for 27", 3690 for 30", 3930 for 33", 4400 for 36", 4710 for 39", 5030 for 42".

C. H. KERR.

**Report of Committee C-10 on hollow building tile.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 294-6(1918).—Tabulations of results of compression tests and absorption tests made at the Univ. of Cal. and at the Univ. of Mich. are given but not discussed.

C. H. KERR.

**Tentative tests for molded insulating materials.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 694-706(1918).—The tests apply to all solid insulating materials formed in molds or between platens by the application of pressure, either with or without heat. For tensile strength, figure 8-shaped briquets are tested 1 hr. at  $10^\circ$  below the distortion point. For compression a 1" cube is tested at room temp. For transverse a bar  $1\frac{1}{2}$ " square  $\times$  5" long, supported 100 mm. apart is tested. Dielec. strength shall be tested on a cup shaped sample with  $2\frac{1}{2}$  mm. bottom. For distortion the  $1\frac{1}{2}$ " square  $\times$  5" long specimen is used. A special app. for applying load is described. The temp. is increased  $\frac{1}{2}^\circ$  per min. and distortion point is marked when the deflection at the center is 0.254 mm. Effect of  $H_2O$  is shown by immersion in  $H_2O$  for 100 hrs. at room temp.

C. H. KERR.

**The use of tunnel kilns for brick and other products of crude clays.** ELLIS LOVEJOY. *J. Am. Ceram. Soc.* 1, 628-36(1918).—The kiln is being thoroughly tried out but much must still be done before it will replace other types of continuous kilns. There are under construction or in operation 15 for white ware, porcelain, etc., 5 for refractories, 2 for building brick, and 7 have been abandoned as failures.

C. H. KERR.

**Ovens and kilns with a high thermal efficiency.** A. BIGOT. *Engineering* 107, 80-2(1919).—(1) *Industrial Lab. Kilns:* In expts. made in 1912 it was shown that adding a sheet-Fe recuperator to a Perrot kiln (cuts and description are given) the max. working temp. was increased from 1200 to  $1400^\circ$  and an oxidizing, reducing or neutral atm. could be maintained at will. In 1915 it was found that by surrounding the sheet-Fe recuperator with a good insulator the temp. was further increased from 1400 to  $1750^\circ$ , attainable in 5 hrs. However, the furnace lining melted and the sheet Fe rapidly burned out. Both were replaced by suitable refractories (which are not described). A new furnace of this sort has been built at the testing lab. of the Conservatoire National des Arts et Métiers. (2) *Industrial Kilns:* The same ideas are applicable to com.

kilns. Insulators like infusorial earth, light  $MgO$ , asbestos, etc., are not effective above  $800^{\circ}$  and should not be used above  $1000^{\circ}$ . For kiln walls ordinarily 27" thick the outer 18" may be replaced by 3" of insulating brick, since it shows only  $\frac{1}{6}$  the heat cond. Outside this a 1.8" layer of insulating powder should be used. Tests made on an intermittent kiln showed: before the above changes, temp.  $1230^{\circ}$  in 78 hrs.; after the change  $1465^{\circ}$  in 58 hrs. For kilns with movable bottoms the bottom plates should roll on refractory balls, these balls having 3 chief properties: (1) resistance to wear when hot or cold, (2) high crushing strength at various temps., (3) ability to withstand sudden temp. changes. No data regarding compns. or properties are given. Great claims are made for patented kilns which are illustrated and briefly described. It is claimed that the burning of  $SiO_2$  wares is solved. Low fuel consumption is especially claimed.

C. H. KERR.

**The dissociation of salt.** H. V. THOMPSON. *Trans. Eng. Ceram. Soc.* 17, 340-50 (1918).—At  $1113^{\circ}$  1 g. mol. of  $H_2O$  decomposed 0.37 g. mol. of  $NaCl$ . Preliminary expts. to show the action of  $NaCl$  and  $H_2O$  vapor on  $SiO_2$ ,  $Fe_2O_3$ ,  $Al_2O_3$  and clays are described.

C. H. KERR.

**Electricity in the ceramic arts.** J. P. ALEXANDER. *Gen. Elec. Rev.* 22, 113-6 (1919).—Descriptions of the various processes employed in the pottery industry and the advantages obtained by elec. drive, etc. Of particular interest to the chem. engineer.

C. G. F.

**Notes on the evolution of the ganister industry in the Sheffield district.** J. HOLLAND. *Trans. Eng. Ceram. Soc.* 17, 293-9 (1918).—A brief historical and general description.

C. H. KERR.

**The bending of easy-fired ware.** BERNARD MOORE. *Trans. Eng. Ceram. Soc.* 17, 351-9 (1918).—A pottery body is considered simply as an infusible framework and a fusible flux or matrix. The lower types of bodies, such as earthenware, are generally low in matrix and high in infusible framework while porcelain types are the reverse. But the kind of matrix is radically different, that of the earthenware type being much the more fusible. Eutectic compns. play an important role. Points to be considered are: (1) texture—fineness of grinding, (2) method of mixing, (3) uniform distribution of fine particles to avoid clumping, (4) early and steady vitrification of the matrix, (5) full contraction produced in the first fire if the body must withstand compression or tension at a high temp. in the second fire.

C. H. KERR.

**The deterioration of molds during storage.** J. W. MELLOR. *Trans. Eng. Ceram. Soc.* 17, 331-5 (1918).—The "fur" that grows on the molds "contains a considerable proportion of  $Na_2SO_4$  derived partly from sol. salts in the clay, partly from solns. of plaster of Paris in  $H_2O$ , and partly from the decompn. of  $Na_2CO_3$  and  $Na$  silicate by the  $CaSO_4$ ." Preventive precautions are (1) thorough drying before storing, (2) rapid drying in use so as to keep the crystals small, (3) storing in rooms that are warm and dry enough to prevent condensation during muggy weather.

C. H. KERR.

#### Tests of glassware (KROEBER) 17.

**Marking enameled ware.** W. J. KOHLER. U. S. 1,290,580, Jan. 7. Enameled ware is provided with a ground coat of binding material, heated to whiteness and then given a coat of powdered enamel, again heated to a white heat and given a second coat of powdered enamel, marked with enamel of different color and again heated to effect a smooth union of the different enamels.

**Refractory material for crucibles.** F. J. TONE. U. S. 1,289,578, Dec. 31. Crucibles are formed of a mixt. of natural or artificial graphite 40, fused cryst.  $Al_2O_3$  40 and plastic clay 20 parts. The crucibles formed have greater freedom from tendency

to split along cleavage planes than crucibles made from graphite and clay alone and will withstand sudden changes of temp. without cracking. They are well adapted for melting Fe or steel.

**Refractory material for crucibles.** F. J. TONE. U. S. 1,289,966, Dec. 31. A mixt. of graphite 40, zirconia 40 and plastic clay 20 parts is used for making crucibles, retorts, muffles or other refractory articles.

**Purifying fire-clay.** H. L. KOHLER. U. S. 1,290,241, Jan. 7. Finely divided clay is sepd. from heavy sands and feldspars by the action of air currents and is then subjected to a magnetic sepn. to purify it further.

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## 20. CEMENT AND OTHER BUILDING MATERIALS.

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C. N. WILEY.

**Cement in 1917.** ERNEST F. BURCHARD. With a section on concrete ships. ROBERT W. LESLEY. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Pt. II, 343-80 (preprint No. 24, published Feb. 4, 1919); cf. C. A. 12, 615. E. H.

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**BLANCHARD, ARTHUR H., et al.: American Highway Engineers' Handbook.** New York: John Wiley & Sons, Inc. 1683 pp. 55. For review see *Eng. News-Record* 82, 387(1919) or *Manufacturers Record* 75, 114(1919).

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**Composition for covering cement surfaces.** C. P. ANDERSON. U. S. 1,290,035, Jan. 7. A compn. for covering cement surfaces for producing uniform architectural finishes is formed of ZnO 480 lbs., calcined plaster 180 lbs., ground asbestos 60 lbs., finely ground pumice stone 150 lbs., "prepared oil" 32 gals., turpentine oil 5 gals. and naphtha or benzine about 10 gals. The "prepared oil" is formed of boiled linseed oil 55, boiled China wood oil 35, litharge drier 20 and naphtha or benzine 90 parts. The compn. is applied to clean porous or roughened surfaces, with a brush, in the same manner as oil paints are applied. A somewhat porous coating is formed which permits passage of moisture through the material without forcing off the coating. Pigments may be added to the coating mixt. to give it any desired color.

**Pavement composition.** A. E. SCHUTTE. Can. 187,504, Nov. 19, 1918. A wear-resisting material free from dust filler is mixed with bituminous cement having asbestos fiber incorporated therewith.

**Insulating or building material from dolomite.** A. M. MITCHELL. U. S. 1,289,862, Dec. 31. Dolomite is crushed and heated sufficiently to dehydrate it, and then mixed with S and paraffin 2% while hot and cast in a mold under pressure to form an insulating or building material.

**Roofing material.** F. C. OVERBURG. Can. 188,744, Feb. 18, 1919. Flexible roofing is made by simultaneously impregnating sep. sheets of fibrous material with a water-proofing compd. supplying a layer of non-adhesive material between the sheets to prevent their adherence, then bringing the sheets into facial contact, coating the exterior of the sheets with a bituminous compd. and sepg. the sheets. App. is also specified.

**Asphaltic roofing.** H. R. WARDELL. U. S. 1,289,328, Dec. 31. Roofing material, which may be made of satd. felt with an asphalt surface, is coated, while its surface is hot, with particles of grit moistened with an asphalt solvent such as naphtha or gasoline.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Fuel economy in the boiler house.** I. JOHN B. C. KERSHAW. *Chem. Met. Eng.* 20, 176-8(1919).—K. emphasizes the importance of systematic control of waste gases in boiler plants and discusses details in installation and maintenance of automatic CO<sub>2</sub> recorders. Glass tubing connected by best red rubber, wired on, is recommended in preference to metallic pipe for connections between recorder and individual boiler flues. Glass stopcocks, soot filters, and water-jet pumps are discussed.

A. G. BLAKELEY.

**The chemical and physical control of boiler operation.** E. A. UEHLING. *J. Am. Soc. Mech. Eng.* 41, 137-41, 199(1919).—The author shows by actual example certain calcns. which may be made from data given by recording-instrument charts, with a view to increasing the efficiency of power plants. Formulas and tables of results accompany the discussion.

F. W. SMITHER.

**Coal economics.** G. BASTIEN. *l'Industrie chimique* 5, 313-5(1918).—A review and discussion of a paper by Brownlie, *et al.* (*C. A.* 13, 255; cf. also *C. A.* 13, 66).

F. W. SMITHER.

**A fusion bomb for sulfur determination in coal.** S. W. PARR. *J. Ind. Eng. Chem.* 11, 230-1(1919); illus.—The app. is adapted for use in S detn. in coal by use of Na<sub>2</sub>O<sub>2</sub>. It has also been used satisfactorily in the detn. of S in pyritic material, in rubber and in other org. combinations. It has still wider application in the detn. of carbonaceous matter in soils, and as a substitute for the Carius method of detg. halogens in org. compds.

E. J. C.

**Estimation of sulfur in spent oxide.** WM. DIAMOND. *J. Soc. Chem. Ind.* 37, 336-71(1918); *Gas J.* 145, 24(1919).—The S in spent oxide is usually estd. by extn. with CS<sub>2</sub>. But the results are often misleading due to the presence of other impurities, such as CN compds., NH<sub>3</sub>, tar and oil, extd. by the CS<sub>2</sub> and weighed as S. According to Mendelyev, S is sol. in CS<sub>2</sub> in practically all proportions, but is only slightly sol. in cold benzene. By washing dry spent oxide with several portions of benzene, all the tar and oil will be extd., leaving only the S to be extd. with CS<sub>2</sub>. About 10 g. of the oxide is placed in an extn. thimble and 9 successive portions of 20 cc. of cold benzene are poured over the sample, each portion being allowed to filter through the oxide before another portion is added. The whole ext. is divided into 2 parts: the first is evapd. to dryness and the residue weighed, the second is evapd. to dryness, boiled down with HNO<sub>3</sub>, H<sub>2</sub>O is added, and the S pptd. by BaCl<sub>2</sub> and weighed as BaSO<sub>4</sub>. The first estn. gives total tar, oil and sol. S compds., the second represents S only. The S is then extd. from the same sample with CS<sub>2</sub> in a Soxhlet extn. app. as usual. The weighings will give (1) tar, oil and organic matter sol. in benzene, (2) S compds. sol. in benzene, (3) S extd. by CS<sub>2</sub>. In one test extn. with benzene gave residues of 14.18 and 13.37% in duplicate tests; the amts. of S found by weighing as BaSO<sub>4</sub> were 9.17 and 8.22%; thus the % of tar and other sol. matter were 5.01 and 5.14%, av. 5.07%. The amts. extd. by CS<sub>2</sub> from the original oxide were 49.87 and 49.79%, av. 49.83%. so that the actual S content of the sample was 44.76%.

J. L. WILEY.

**Relation between molecular structure and the activity towards hydrogen sulfide of oxide of iron.** G. WEYMAN. *J. Soc. Chem. Ind.* 37, 333-61(1918).—The sulfides of Fe with which gas purification is concerned are Fe<sub>3</sub>S<sub>4</sub>, which is oxidized to free S and Fe<sub>2</sub>O<sub>3</sub>; FeS, which is also oxidized to free S and Fe<sub>2</sub>O<sub>3</sub>, and which at higher temps. may combine with free S to form FeS<sub>2</sub>. Purification of coal gas is carried on at temps. somewhat above the normal under which conditions Fe<sub>3</sub>S<sub>4</sub> is the chief product. It has been previously found (*J. Soc. Chem. Ind.* 1883, 156) that by treating the hydrate pptd.

by  $\text{NH}_3$  from  $\text{FeCl}_3$  with  $\text{H}_2\text{S}$  and treating the product with  $\text{CS}_2$  out of contact with air, there was obtained a variable amt. of free S which bore no relation to the total quantity of free S obtained after oxidation. Free S is always present and  $\text{FeS}_2$  is produced by local heating. Subsequent oxidation might account for part of the  $\text{FeSO}_4$  found. This reaction always results in the liberation of  $\text{SO}_3$ . To be efficient the oxide must be kept in an alk. condition, in which case the  $\text{FeSO}_4$  formed is at once decompd. with liberation of  $\text{Fe(OH)}_3$ . Even in an alk. condition the activity of the oxide falls off in time. In an acid condition the amt. of Fe rendered inert by formation of ferric and ferrous salts or as  $\text{FeS}_2$  is not sufficient to account for the almost complete inactivity of the whole body of the oxide. From expts. carried out to det. the temp. at which hydrated oxide becomes inactive, it is evident that  $\text{Fe(OH)}_3$  dehydrated at as high a temp. as  $650^\circ$  may still retain its activity in the cold. At about  $700^\circ$  a change sets in which may also be effected at lower temps. by very prolonged heating. Under certain conditions and with particular varieties of oxide, the absorption of  $\text{H}_2\text{S}$  may take place in the comparative absence of  $\text{H}_2\text{O}$ . In all cases but one the oxide obtained after heating to from  $100^\circ$  to  $650^\circ$  gave in the cold practically theoretical absorption calcd. on the content of  $\text{Fe}_2\text{O}_3$ . Oxide heated to  $700^\circ$  gave only a partial absorption, the extent of which depended on the time of heating, and ranged from 10–32% of the  $\text{H}_2\text{S}$ . Oxide heated to  $800^\circ$  absorbed less than 1%. In all cases most of the water of hydration was given off before  $300^\circ$ . Even the oxide heated to  $800^\circ$ , which was inactive in the cold, absorbed the gas rapidly at the higher temp. This indicates that the change in structure which inhibits the action of  $\text{H}_2\text{S}$  in the cold must take place on cooling, and that at  $800^\circ$  the oxide mols. are in such a mobile state that slow cooling gives them an opportunity of arranging themselves in a more condensed state. To obtain further evidence of this some oxide was heated for 3 hrs. to  $800^\circ$  and all but a check portion was plunged suddenly into cold water. The check sample which was cooled slowly absorbed less than 1% of  $\text{H}_2\text{S}$  in the cold, while after drying the quickly cooled sample absorbed 43%. The sp. grs. of the powders obtained by heating to various temps. and cooling slowly showed a progressive rise: at  $300^\circ$  sp. gr. = 4.207,  $510^\circ$  = 4.444,  $700^\circ$  = 4.485. "Burnt oxide" from the manuf. of  $\text{H}_2\text{SO}_4$  and sometimes used for gas purification, is in a similar condition to the oxide heated above  $700^\circ$ . It is then concluded that the chem. activity of  $\text{Fe}_2\text{O}_3$  is dependent primarily on mol. structure, and not on any particular degree of hydration. At the same time the mol. structure is evidently derived from some form of hydrate. W. reviews the work of former investigators on the constitution of ferric hydrates and shows how their conclusions are confirmed in the study of gas purification.

J. L. WILBY.

**Soft coal for water gas.** ROBERT B. HARPER. Peoples' Gas, Light & Coke Co., Chicago. *Gas Record* 14, 257–64(1918); *Gas J.* 145, 121(1919).—A detailed analysis of factors affecting the use of bituminous coal in water-gas generator is given. A change in the compn. of the generator fuel from that of a good coke to that of a bituminous coal may result as follows: (1) In the increase of clinker or ash to be removed thus increasing the cleaning time and reducing the gas made per day by as much as 5%. (2) In the production of lumpy or coarse ash presenting less surface for chem. action, affecting the compn. and hence the fusion point and physical condition of the resulting clinker. (3) In the liberation of considerable volatile matter from the coal, which being driven off during the blast causes more or less smoke at the open stack valve. (4) In the increase of the heating value and perhaps also of the sensible heat of the producer gas, tending to result in overheating of the checkerbrick in the carburetor and superheater. (5) A decrease of perhaps 40% in the output of blue water-gas and 35% of crude carbureted water-gas. (6) An increase of the time of contact of the oil vapors and gases with the blue water-gas and the brick surface in the car-

buretor and superheater due to the decrease in the rate of output of blue water-gas from the generator resulting in a more extensive cracking and less efficient decompn. of the oil at the same checkerbrick temp. used in the case where the generator fuel is coke. (7) A change in the compn. of the blue water-gas by the liberation of some volatile matter so that the heating value tends to be increased as much as 40 B. t. u. per cu. ft., thus making a slight oil saving in the manuf. of carbureted water-gas. (8) In the possibly detrimental effect of the compn. of the blue water-gas upon the compn. of the crude oil-gas produced and the tendency to increase the deposition of C on the checkerbrick and the amt. of tar formed. (9) In the formation of more  $H_2S$  due to an increase in the % of total S in the fuel charged, resulting in overloading the purifying equipment. (10) In the variation of the free space for gases in the generator fuel due to the tendency of bituminous coal to form "channels" in the fuel bed or a packed condition of the fuel, both conditions being detrimental to good results. (11) In maintaining a shallower fuel bed in order to permit primary or main blast air to pass more readily through the fire. (12) In the possible tendency of the ash of some coals under certain blast conditions to blow over from the generator and form deposits on the checkerbrick, thus rendering the efficient decompn. of the gas oil less likely. (13) In the formation with some coals of a clinker or ash of such a nature as to cause a loss of practically unrecoverable C amounting to as much as 3% of the fuel charged. (14) In the increase in the amt. of steam used per M cu. ft. of gas in order to keep the physical conditions of the clinker such as to permit its easy removal. (15) In the probable lowering of the temp. of the fuel surface, because of the smaller amt. of surface and more compact nature of bituminous coal, tending to increase the excess steam leaving the generator, thus having a somewhat detrimental effect upon the gas oil compn. (16) In the securing of some economies in the manuf. of carbureted water-gas in case the difference in costs of coke and coal is sufficiently large and other conditions permit advantage being taken of such possible economies. (17) In the impossibility of manufg. enough carbureted water-gas with bituminous coal to meet the requirements of customers of a gas company whose max. possible gas machine capacity with good coke is only sufficient to meet such requirements.

J. L. WILEY.

**Steaming horizontal retorts.** R. J. R&W. *Gas J.* 145, 69-70(1919); *Gas World* 70, 35-6(1919); cf. *C. A.* 12, 1697.—It has been thought that the horizontal retort is unsuitable for water-gas production, but R. shows that when the work is carried out in a scientific way good results are realizable, although not so good as are possible with vertical retorts. The conditions inside the retorts are altogether unlike and therefore the methods must be varied. In regard to steaming, horizontal retorts clearly have limitations, but nevertheless steaming can be made a paying proposition both in the increased production of gas and in the saving of fuel and labor. Instead of the usual production of 11,300 cu. ft. of gas, R. obtains now an av. of about 14,200 cu. ft., meanwhile saving 20.4% of coal. At the end of an 8-hr. carbonizing period, a couple of retorts in a bed of sixes or eights are set off and the spent charges are steamed for 40 hrs. It is preferable that the 2 retorts be of special construction, and such a retort is the subject of a patent. Superheated steam is essential, and great care must be taken not to overdo the steaming. Max. time-contact is necessary, which means low steam pressure and speed. The reason the steam cannot be continuously applied during the whole carbonizing period as in continuous vertical retorts is that, with a comparatively shallow depth of semi-carbonized coal, or partially incandescent coke, the production of  $CO_2$  would be enormously increased. But, providing the app. and methods are correct, during the 40-hr. steaming period, good water gas is produced from the 2 retorts and also at the same rate per retort as when making coal gas. The amt. of  $CO_2$  is kept within a 5% av. This is higher than the av. with continuous vertical retorts,



but is not a matter of great importance. A disadvantage is that the hydrocarbons are not accelerated and protected from degradation in their departure from the retorts, nor is there the additional H to pick up some of the residual volatile matter from the coke. No figures are given as to the calorific value or analyses of the mixed gas. 140 gas companies have decided to give the process a trial, which speaks well for the possibilities of the method.

J. L. WILEY.

**The use of peat in steam generators and in gas producers.** L. F. *Rev. chim. ind.* 27, 188-91(1918).—When peat is employed for the heating of boilers, the grate-bar spacing is less than that required for coal. The distance between grate-bars depends upon the grade of peat used and varies between 8 and 20 mm. The av. height of the bed of peat above the grate varies between 75 and 250 mm. In Sweden 1 kg. of peat has evapd., in a tubular boiler, 4.32 kg. of vapor at 6.7 atms. pressure, whereas with coal, 7.44 kg. of vapor are obtained under the same conditions. In other words, one unit of coal is equiv. to 1.72 units of peat. Locomotives require about twice as much peat as coal, by weight, and two firemen are required when peat is used. Inclined grates have been designed to handle peat and may be made automatic. The use of peat in the so-called semi-gas producers has been generally successful and special app. has been designed to burn powdered peat. There are several types of producers designed to handle peat among which are: the G. Korting, G. Luther and Ziegler, which are in use in Germany and Sweden, the Mond, and Limm in use in England and Italy, and the Riché and Allégre et Fabre, used in France. Several details of these types are given.

J. H. YOUNG.

**Unusual carbonizing methods.** JAMES A. BROWN. *Gas J.* 145, 28(1919).—A paper read before the Michigan Gas Association descriptive of inclined oven plants at Flint, Mich., and Evansville, Ind., and horizontal oven plants at Jackson, Pontiac, and Kalamazoo, Mich. Some difficulties in design and operation of plants and remedies therefor are given. Mechanically operated plants handling large charges and horizontal ovens for capacities above 500,000 cu. ft. are recommended. J. L. WILEY.

**Ammonia plant at the Stockholm gas works.** ANON. *Gas Age* 43, 132-4, 183-5 (1919); illus.—A detailed description of modern aqua-NH<sub>3</sub> and (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> plants of latest Swedish design operating under the indirect process. The latter has a capacity for treating 210 cu. ft. of 2% ammoniacal liquor in 24 hrs., the former 1750 cu. ft. NH<sub>3</sub> in 24 hrs.

J. L. W.

**Analyses of commercial "pure" benzene.** F. BUTLER JONES. *J. Soc. Chem. Ind.* 37, 324-71(1918).—A new method for the detn. of small quantities of thiophene, toluene, CS<sub>2</sub> and paraffin, in benzene in absence of other compds. is described. The method is based upon the fact that the depression of the f. p. of solns. of up to 4% of thiophene, CS<sub>2</sub>, toluene and paraffin in benzene is nearly proportional to the wt. per cent. of solute present. The measurements required are three f. ps. and one sp. gr. The first freezing-point detn. is taken on the soln. containing all 4 compds., after which the CS<sub>2</sub> is removed by means of alc. potash. The second f. p. is taken of the soln. freed from CS<sub>2</sub>. Thiophene is then removed by shaking with a cold soln. of basic mercuric sulfate and a 3rd f. p. is detd. The sp. gr. of this last soln. is also taken. By making use of curves which are given, the f. p. information and the sp. gr. figure may be translated into the percentage of each of the components in the system. The method is applicable to commercially "pure" benzene.

J. H. YOUNG.

**Determination of the water content in tar.** W. SPALTEHOLZ. Amsterdam. *Chem. Weekblad* 15, 1546-8(1918).—An iron kettle containing 1½ l. is used to det. the H<sub>2</sub>O in tar. It has a side outlet near the top, and 4 openings in the cover, one for a thermometer, one connected with the side outlet, one for a condenser, and one bearing a dropping funnel. The funnel discharges into a small cylindrical reservoir which

overflows into the kettle. To make the detn., fill the kettle with anhydrous high boiling anthracene oil, heat to  $270^{\circ}$  and let the tar sample drip slowly into the hot oil from the funnel. The high boiling part escapes through the side outlet, the  $H_2O$  through the condenser. The app. requires no refilling after a detn., and permits rapid and sufficiently accurate work. Also in *Het Gas* 38, 302-4(1918). JULIAN F. SMITH.

Tentative specifications for coal-tar pitch for use in damp-proofing and waterproofing. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 635-8(1918).—Tentative specifications covering coal-tar pitch for use in waterproofing and damp-proofing, recommended for use under uniformly moderate temp. conditions. J. H. YOUNG.

Solubilities, separation and purification of anthracene, carbazole and phenanthrene (CLARK) 10. Coal in southeastern Idaho and western Wyoming (SCHULTZ) 8. Sulfuric acid plants ("P") 18.

Artificial fuel. T. TWYNAM. *Brit.* 121,373, Dec. 29, 1917. Wet or air-dried peat is intimately mixed with dry pitch and coke dust or small coal, or with coke dust and small coal, the whole being ground together. The product may be molded into blocks for use as fuel or for use in coke ovens. The coke dust and dry pitch may be mixed in the proportion of 3 to 2, and 100 parts of wet peat and 15 parts of the mixt. may be ground together.

Coal gas. W. D. WILCOX. U. S. 1,289,336, Dec. 31. Coal containing a high % of moisture is passed continuously downwardly through an externally heated retort. A distn. at relatively low temp. takes place in the upper portion of the retort and gaseous products are withdrawn from an outlet in the upper portion of the retort. A distn. at relatively high temp. takes place in the lower portion of the retort and gases are also withdrawn from the lower portion. The residue from the retort is fed into a generator chamber below and connected with the retort and the material in the generator chamber is alternately treated with air and with the gaseous products from the low-temp. distn. Several retorts are operated simultaneously and the operations in them are so conducted that the low-temp. gases may always be passed directly as formed into residue in one of the generator chambers. Gaseous products from the passage of air through the residue in the generator chamber are led to a common heating chamber supplying the flues which surround and heat the retorts and are burned therein. Gases from the passage of gases of low-temp. distn. through the residue are led through the lower portion of the connected retort to the lower outlet therefrom.

Removing water from peat. A. TEN BOSCH. U. S. 1,290,494, Jan. 7; Can. 188,789, Feb. 18, 1919. Peat from which  $H_2O$  is to be removed is forced in the form of a pulp, in a continuous stream, through a vertical pipe in which the weight of the column of peat exerts considerable pressure upon its lower portion and steam under pressure is forced into the lower part of the column.  $H_2O$  is forced out under pressure.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Commercial possibilities of oil shale. H. J. WOLF. *Eng. Mining J.* 107, 217-9 (1919).—A review of current possibilities of oil shale, with a description (with illustrations) of the Utah and Colorado oil-shale deposits and details of the present state of their development. F. W. SMITHER.

Borings for oil in the United Kingdom. V. C. ILLING. *Nature* 102, 385-8(1919).—The possibility of finding commercial quantities of oil in the drillings that are now being made in selected areas in Great Britain is discussed from a geological point of

view and the evidence is thought to warrant the conclusion that large commercial underground supplies of petroleum do not exist in the country. W. H. ROSS.

**Report of committee D-2 on lubricants.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 321-2(1918).—The committee recommends the adoption as standard of the tests presented last yr. (cf. *Proc. Am. Soc. Testing Materials* 17, Pt. I, 767(1917)) with the addition of the stipulation that in detg. d. "correction for the buoyant effect of the atm. shall be made when necessary." The tests included: cloud and pour test for petroleum oils except steam cylinder and black oils; cold test for steam cylinder and black oils; free acid; C residue. It is also recommended that "standard temps. for viscosities" contained in the last report be withdrawn. F. W. SMITHER.

**Internal-combustion engine: lubrication and lubricants.** P. H. CONRADSON. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 387-92(1918).—See C. A. 12, 2247.

F. W. SMITHER.

**The formation of a precipitate in lubricating oils during use.** H. I. WATERMAN. Dordrecht. *Chem. Weekblad* 15, 1610-1(1918).—A sample of used lubricating oil settled in 3 layers, the bottom being clear water, the middle an opaque ppt. and the upper layer clear brownish oil. The ppt. was only an emulsion of the oil with pure water, evidently the condensate from the machine in which the oil had been used. Analyses of fresh samples showed that the oil itself was of mineral origin and of good quality. JULIAN F. SMITH.

**Tentative specifications for asphalt for use in damp-proofing and water-proofing.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 630-3(1918).—The specifications cover asphalt for use in damp-proofing and water-proofing, recommended for use under uniformly moderate temp. conditions. J. H. YOUNG.

**Tentative specifications for primer for use with asphalt for use in damp-proofing and water-proofing.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 634(1918).—The specifications cover primer for use, when specified, with asphalt for use in damp-proofing and water-proofing. J. H. YOUNG.

**Tentative methods for determination of softening point of bituminous materials other than tar products.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 707-8 (1918).—Tentative method for detn. of softening point of bituminous materials other than tar products as issued in 1916. J. H. YOUNG.

**Tentative specifications for creosote oil for priming coat with coal-tar pitch for use in damp-proofing and water-proofing.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 639-40(1918).—The specifications cover primer for use under coal-tar pitch, when specified. J. H. YOUNG.

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**The recovery of waste paraffined paper (KRESS, HAWLEY) 23.** Oil-filtering apparatus (U. S. pat. 1,290,820) 1.

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GUTTENTAG, WILFRED E.: **Petrol and Petroleum Spirits: A Description of their Sources, Preparation, Examination and Uses.** New York: Longmans, Green & Co. 135 pp. \$3.40.

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**Cracking oils.** C. ELLIS, N. L. FOSTER and ELLIS-FOSTER Co. Brit. 121,356, Dec. 15, 1917. Heavy petroleum oils are treated for the production of gasoline, etc., by passing their vapors through a zone of progressively increasing temp., and then subjecting the cracked products to a progressively decreasing temp. until the secondary reactions due to the unsatd. nature of the products of the cracking operation have attained a stage of equil. A suitable app. is specified.

**Acid-coke as fuel.** G. L. PRICHARD. U. S. 1,290,345, Jan. 7. A fuel suitable for burning in fuel-oil burners is formed by mixing heated oil with acid coke from sludge acid, obtained in petroleum refining.

**Hydrocarbon extraction from shale.** V. Z. REED. Can. 188,464, Jan. 28, 1919. The shale or coal containing the desired hydrocarbon is treated with hot vaporous material containing acid, the vapors condense in the shale and in passing downward therethrough exercise a solvent action on the oil material; the solvent and extd. matter are recovered and distd.

**Breaking up emulsions of oil and water.** F. M. SEIBERT and J. D. BRADY. U. S. 1,290,369, Jan. 7. Emulsified oil and  $H_2O$  are sepd. by passing the liquid in a flowing stream between a pair of electrodes between which a potential of 250-600 volts is maintained, spaced sufficiently far apart to prevent passage of any substantial amount of current. The electrodes may be of tubular form and concentrically placed.

### 23. CELLULOSE AND PAPER.

A. D. LITTLE.

Report on the resources and economic needs of France in the post-bellum period, and on the changes to be made in the tariff protecting the paper industry. *Le papier* 21, 188(1918).—The French paper industry demands that a special duty be placed on all wood exported from allied countries to the Central States, and on all pulp imported by Allied countries from the Central States, and also that the tariff be raised on chemical pulp imported into France, but not on mechanical pulp. A. PAPINEAU-COUTURE.

Report of the National Paper Bureau on the needs of the French paper industry during the first five years after peace is declared. *Le papier* 21, 185(1918).—France will need to import annually at least 850,000 steres of wood (1 stere = 35.31 cu. ft.), between 40 and 50,000 tons of waste paper, 100 to 150,000 tons of alfa, 200,000 tons of mechanical pulp, 250,000 tons of chem. pulp, 70,000 tons of kaolin. It can supply its own needs for cotton and woolen rags, and straw. 60,000 to 70,000 h. p. would suffice to manuf. all the mechanical pulp imported and 25,000 h. p. for the chem. pulp imported. The industry can supply all domestic requirements, but there will probably be little or no exportation for some time, with the possible exception of the very highest grade papers. A. P.-C.

The Russian paper industry. Notes on the developments of papermaking in Russia since the XVIth century. Report presented in 1916 to the Paper Committee in Petrograd. G. R. SAEELMANN. *Le papier* 21, 197(1918). A. P.-C.

The art of determining the composition of papers. E. ARNOULD. *Le papier* 21, 161(1918).—This paper does not deal with methods but discusses the qualifications which the paper-mill superintendent should have relative to this art.

A. PAPINEAU-COUTURE.

The recovery of waste paraffined paper by extraction with volatile solvents. OTTO KRESS and L. F. HAWLEY. *J. Ind. Eng. Chem.* 11, 227-9(1919).—Waste paraffined paper was extd. with gasoline in a small intermittent extractor, the amt. of solvent and paper being varied in different runs. Two extns. were made on each charge of paper, the amt. of solvent used in the second extn. being equal to the amt. drained off from the first. Using 20 gals. of gasoline (b. 90-140°) at one application per 7 lbs. of paper, the paraffin retained by the paper amounted to 0.21%, based on the extd. paper. Using 8 gals. of gasoline per 20 lbs. of paper, the paraffin retained was 3.40%. With a large well designed extn. system, it should be possible to get even better results with less solvent. R. B. ROG.

**Tropical grasses as paper-making materials.** ANON. *Bull. Imp. Inst.* 16, 3, 271-5(1918).—*Lalang grass* (*Imperata arundinacea*) covers large areas in the states in the Malay peninsula and is considered a troublesome weed. A sample showed 9.2% moisture, and ash 4%, cellulose 50% (these last being calcd. on the dry material). The grass when treated with from 8 to 20% NaOH soln. yielded from 46 to 40% of dry pulp. The pulp did not bleach readily but possessed good filling qualities and produced a strong opaque paper. A specimen of *bamboo grass* from Northern Australia was also examd. This material showed 9.9% moisture, and 12.2% ash (expressed on dry grass) and 48.9% cellulose. The grass, when boiled for 5 hrs. at 140° with 16 to 20% NaOH, yielded 43 and 39% dry pulp. It was found that the quality of the pulp could be improved if the nodes of the grass were crushed first. The pulp was bleached and gave a paper of fair quality.

R. L. SIBLEY.

**Cardboard containers for canning.** *Bull. Australian Sci. Soc.; Le papier* 21, 210(1918).—Cardboard containers are coated with a MeOH soln. of a special resin, obtained by action of CO<sub>2</sub> and HCHO, thereby preserving the contents from decompn.

A. P.-C.

**Adhesive from waste sulfite liquor.** W. H. DICKERSON. U. S. 1,290,118, Jan. 7. An adhesive suitable for use in road building, making sand cores, and for other purposes, is produced by concg. waste sulfite liquor *in vacuo*, and, during the concn., adding CaCO<sub>3</sub> in somewhat less amt. than that which would be required for complete neutralization of the acid in the liquor.

**Waterproof paper.** J. T. CROLL. *Brit.* 121,318, Dec. 4, 1917. In the manuf. of waterproof paper, the paper is passed directly from the delivery end of a paper-making machine through a bath of wax or other waterproofing material, then guided through rolls to and in a drying chamber, and there subjected to the action of fans or pressure air.

## 24. EXPLOSIVES AND EXPLOSIONS.

CHARLES E. MUNROE.

**Old and new explosives.** D. H. WESTER. *Artill. tijdschr.* 1918, 26 pp.; *Chem. Weekblad* 15, 1364-5.—A résumé of a series of lectures. Although some progress has been made in recent years, the ideal explosive (hexanitrobenzene) is yet to be prepd.

JULIAN F. SMITH.

**Studies of modern brisant explosives.** C. F. VAN DUIN. Thesis, Utrecht 1918, 113 pp.; *Chem. Weekblad* 15, 1521-3.—The work of previous investigators on explosives is reviewed. Methods of prepn. are given for many explosives, some of which are of only theoretical interest. In a study of the constitution of 2,4,6,2',3',4'-hexanitrodiphenylamine, in which only the positions 2, 4, 6 and 3' were previously known to be correct, it was shown that the 5th NO<sub>2</sub> group is in the position 4'. Evidence, but not proof, was found that the 6th is in the position 2'. In a study of tetranitrophenylmethylnitramines, it was shown that the mobility of the methylnitramine group is increased by the introduction of a positive substituent in the meta position, and decreased by a negative group in the meta position. The introduction of a mobile NO<sub>2</sub> group or a 2nd methylnitramino group in such compds. greatly increases the sensitivity to shock.

JULIAN F. SMITH.

**Quantitative determination of acetone in smokeless powder.** A. PIERONI. *Atti r. accad. Lincei* 27, II, 52-7(1918); *J. Soc. Chem. Ind.* 37, 749A.—Discordant results obtained in the detn. of Me<sub>2</sub>CO are due to the difficulty of converting Me<sub>2</sub>CO quant. into CHI<sub>3</sub>, to the ease with which the latter is attacked by excess of alkali, to the loss

of I owing to secondary reactions, and to the volatility of  $\text{CHI}_3$ . The following procedure gives satisfactory results with smokeless powders which contain between 3 and 0.25% of  $\text{Me}_3\text{CO}$ : From 35 to 50 g. of the powder in lumps is weighed to the nearest 0.01 g. and ground in a special app. in which the powder is kept washed by a stream of distd.  $\text{H}_2\text{O}$  so as to prevent evapn. of the solvent. The ground mass, together with the  $\text{H}_2\text{O}$ , is either collected in a large beaker or passed directly through a funnel into a distn. flask of about 2 l. capacity; 100 cc. of dil.  $\text{H}_2\text{SO}_4$  (1:1) is then added to prevent emulsification of the distillate. Steam is passed into the flask, which is also heated with a burner. The distillate passes from the condenser into a bulb'd adapter reaching almost to the bottom of a test tube full of water in a conical flask. From the latter unabsorbed gases pass through a washer, which retains any traces of  $\text{Me}_3\text{CO}$  still unabsorbed. When 250–300 cc. of distillate, *i. e.*, rather more than one-half of the vol. of liquid originally in the distg. flask, has been collected, the adapter is removed and a little fresh distillate is collected in a test tube and tested for  $\text{Me}_3\text{CO}$  by means of KOH and I. When  $\text{Me}_3\text{CO}$  ceases to distil over, the whole of the liquid in the collecting flasks, together with the washings of these and of the adapter, is made up to 500 cc. in a measuring flask. Exactly 100 cc. of the mixed soln. is pipet'd into a cylinder of about 300 cc. capacity with a ground stopper. From two burets are then run in a soln. containing 112 g. of KOH per l. and another containing 257 g. of I and 330 g. of KI per l.; the two solns. should drop at the same time and at the rate of about 20 drops per min., the cylinder being kept shaken meanwhile. From time to time the addition is stopped for a time until the  $\text{CHI}_3$  settles and the supernatant yellow liquid clarifies; if further addition of the KOH and I solns. produces no turbidity, the transformation of the  $\text{Me}_3\text{CO}$  is complete. After a rest of a few mins., such excess of NaCl is added that 10 g. or so remains undissolved, 50 cc. of  $\text{Et}_2\text{O}$  kept over Na is added, the cylinder tightly closed and the liquid shaken energetically three or four times. As soon as the two layers have sepd. completely, 25 cc. of the ethereal  $\text{CHI}_3$  soln. is pipet'd into 25 cc. of satd. alc. KOH soln.; the vol. of alc. KOH to be used varies with the vol. of I used in the reaction with the  $\text{Me}_3\text{CO}$ , the former being in general double the latter. The liquid is dild. with EtOH until clear, heated in a water bath to evap. the  $\text{Et}_2\text{O}$ , and boiled for 15 min.; the EtOH is then distd. off, the liquid dild. with  $\text{H}_2\text{O}$ , cooled, and acidified with dil.  $\text{HNO}_3$ , and the KI formed detd. volumetrically by Volhard's method. If *a* is the number of cc. of 0.1 *N*  $\text{AgNO}_3$  soln. used and *b* the weight in g. of the powder taken, the percentage of  $\text{Me}_3\text{CO}$  in the latter will be  $2a/b$ . CHARLES E. MUNROE.

**Analysis of detonator compositions.** MARQUEYROL AND P. LORLETTE. *Bull. soc. chim.* 23, 401–3 (1918).—A rapid method for the detection and approx. detn. of the components of detonator charges, some of which may be present in but small quantities. (1) Digest with anhydrous  $\text{Et}_2\text{O}$  which dissolves such substances as T. N. T., picric acid and tetryl. Filter, wash insol. residue with  $\text{Et}_2\text{O}$ , evap. the filtrate on tared crystal, dry at  $60^\circ$ , weigh, and then identify by the reactions characteristic of the several nitro-substitution compds. (2) Digest the residue from above in a few cm. of cold  $\text{H}_2\text{O}$ . Filter, wash with a very little cold  $\text{H}_2\text{O}$ , evap. the filtrate at  $60^\circ$  on tared crystal and weigh. Then exam. this mass for chlorates, nitrates, etc. (3) Treat the second insol. residue above with 10 cm. of a cold 5% soln. of KCN, digest for 2 hrs. with occasional shaking, filter, wash with a few cm. of the KCN soln. and then  $\text{H}_2\text{O}$ . Electrolyze the filtrate in a crucible with a Riche app. of 2 accumulator elements, weigh the Hg and calc. the  $\text{Hg}(\text{ONC})_2$ . Or decompose the KCN soln. with  $\text{HNO}_3$ , when practically all the  $\text{Hg}(\text{ONC})_2$  will sep. out. (4) Place the residue insol. in KCN soln. in a small distg. flask with a few cc. of  $\text{H}_2\text{O}$  acidify with 1 cm. of glacial AcOH, heat to boiling and filter into a 5% soln. of  $\text{AgNO}_3$ . When  $\text{PbN}_3$  is present  $\text{AgN}_3$  is pptd. This is collected, washed with a little  $\text{H}_2\text{O}$ , then EtOH and  $\text{Et}_2\text{O}$ , dried, weighed and

the  $\text{PbN}_3$ , calcd. from it. The  $\text{AgN}_3$  is identified by its behavior under blows and in flames. Examples of results are given. Cf. *C. A.* 12, 628, 995, 2440. C. E. M.

**Trinitrotoluene residues and their utilization.** MAURICE COPISAROW. *Chem. News* 118, 13-4(1919).—Residues are derived from (1) spent nitration acids and (2) processes of purification by recrystn. or washing. Dissolved T. N. T. is recovered from spent acids by dilg. the latter. Extended diln. is inadvisable since by no extent of diln. will all the dissolved nitro compds. be pptd., and it renders the recovery of the acids uneconomical. C. advises diln. of acids just enough for sepn. and convenient removal of the bulk of nitro compd. and then extg. acids with  $\text{C}_7\text{H}_8$ , which gives a fairly concd. acid practically free from nitro compds. and a  $\text{C}_7\text{H}_8$ , ext. that may be transferred to the nitrators. Among several methods for the purification of T. N. T. that of employing EtOH as a solvent and crystg. medium or as a washing agent occupies an important position. The latter method yielding a somewhat inferior product presents a considerable technical advantage and its product meets all ordinary requirements. On the removal of the EtOH from the mother liquor or the washings a dark brown, thick liquid was obtained. This was purified by soln. in  $\text{C}_6\text{H}_6$  in which all but 1.35-1.40% was sol. The purified  $\text{C}_6\text{H}_6$ -free substance was found to contain dinitrotoluenes 82.26-80.32% and trinitrotoluenes 17.74-19.68%. On long standing at ordinary temp. the residue gradually crystallizes to a semi-solid mass which centrifuges to (a) a brown solid containing 1.45-1.55% insol. in  $\text{C}_6\text{H}_6$  and (b) a liquid resembling the original residue. The proportion of solid matter so obtained to the total varies appreciably, depending upon the conditions of the alc. treatment and the duration and range of cooling, but it is seldom below 18%. C. nitrated the crude residue with mixed acids ( $\text{HNO}_3$  15-17%,  $\text{H}_2\text{O}$  6%) at 100-120°, obtaining 48.4-64.5% of liquid T. N. T., containing 16.9-17.4% N, which gelatinized gun cotton and was well suited for manuf. of gelatin dynamite. By nitrating this liquid "T. N. T." or the original residue with mixed acids ( $\text{HNO}_3$  17%,  $\text{H}_2\text{O}$  4%) at 120°, a slightly yellowish solid, resembling good quality crude T. N. T., is obtained having a setting point of 57-58° and containing at least 98% T. N. T. This must be regarded as a mixt. of T. N. T. isomers. As  $\alpha$ -T. N. T. forms addition compds. with hydrocarbons, phenol, amines and nitro compds., such as mono- and dinitrotoluenes, Lepsius suggests the possibility that the product consists of a mixt. of addition compds. rather than a mixt. of free isomers. Since according to Will the  $\alpha$ -,  $\beta$ - and  $\gamma$ -trinitrotoluenes, and probably all other modifications, are of practically the same value as explosives, this low melting explosive is useful as a constituent of bellite, roburite and similar blasting explosives, and for war uses where a lowering of the m. p. is required as in the case of the trinitroxylenes. C. styles this material *Iso-Trotyl*. When these T. N. T. residues are treated with bleaching powder  $\text{CCl}_3\text{NO}_2$  is produced, the yield comparing favorably with that obtained from  $\text{HOC}_6\text{H}_4\text{NO}_2$  residues. When these T. N. T. residues are fused with  $\text{Na}_2\text{S}$ , with or without S, dyes are obtained which dye unmordanted cotton fast colors, varying from gray to khaki and brown, the color depending on the concn. of the bath, the temp. and duration of the fusion, and the addition of S.

CHARLES E. MUNROE.

**Fatal cases of poisoning by trinitrotoluene and tetranitromethane.** FISCHER. *Zentr. Gewerbehyg.* 1917, 205; *Chem.-Ztg.* 1918, 42, Rep. 165; *J. Soc. Chem. Ind.* 37, 750A.—The history of 7 fatal cases of poisoning by T. N. T. is described; F. expresses the opinion that the actual cause of the poisoning was the  $\text{C}(\text{NO}_2)_4$  present, in greater or smaller quantity. Evidence in favor of this view is brought forward. C. E. M.

**Spontaneous explosion of the charcoal in liquid-oxygen containers.** LOTHAR WÖHLER. *Chem.-Ztg.* Oct. 5, 1918; *Engineering* 106, 687.—Several cases of explosion of liquid-O containers occurred, all of the vessels having been supplied by one Austrian firm. These vessels, like those of other mfrs., were made of metal, double-walled, with

the jacket-space filled with charcoal to maintain a vacuum. Explosions occurred when the inner wall of the Austrian vessels were so broken that the O had access to the charcoal but did not occur when the vessels of other mfrs. were broken in the same manner. It was found that the charcoal in the faulty vessels contained Zn and Fe and that 3.5% of the latter, in the form of oxide, in the charcoal caused an explosion on contact with O, while 2-3% gave rise to a violent reaction, but less than 2 produced no deleterious effect. The Fe oxide appears to act catalytically as an O carrier, and 0.1 g. of the highly porous charcoal containing the designated amt. of Fe oxide proved sufficient to cause an explosion. W. states that explosions of blasting cartridges containing soot or sawdust and liquid O have occurred during the charging of bore holes due to the liquid O gaining access to combustible material which had been heated by the process of tamping.

CHARLES E. MUNROE.

Course of reaction in explosions of dilute carbon disulfide-air mixtures. G. R. STEWART AND JOHN S. BURD. *J. Ind. Eng. Chem.* 11, 130-3 (1919).—CS<sub>2</sub> is used for destroying burrowing rodents by pumping the vaporized CS<sub>2</sub> into the burrows or by inserting a cloth satd. with the liquid CS<sub>2</sub> and igniting it. Two reactions are possible: (1) CS<sub>2</sub> + 3O<sub>2</sub> = CO<sub>2</sub> + 2SO<sub>2</sub>, (2) 2CS<sub>2</sub> + 5O<sub>2</sub> = 2CO + 4SO<sub>2</sub>. Investigation showed the presence of CO<sub>2</sub>, CO, SO<sub>2</sub>, CS<sub>2</sub> and sulfides in the combustion products, the compn. apparently depending more upon the initial CS<sub>2</sub> concn. than upon variation in the reaction.

CHARLES E. MUNROE.

The inflammation of mixtures of methane and air in a closed vessel. RICHARD VERNON WHEELER. *J. Chem. Soc.* 113, 840-59 (1918).—When an inflammable mixt. of gas and air is ignited within an inflexible closed space, flame travels throughout the mixt. in a manner and at a speed dependent mainly on the nature and proportion of the inflammable gas present. The manner in which the flame spreads through the mixt. is affected also by the shape of the containing vessel and the position of the point of ignition, and the speed of the flame is affected by these factors as well as by the intensity of the means of ignition and the initial temp. and pressure of the mixt. To such causes of variation in the manner and speed of the spreading of the flame must be added mechanical agitation or turbulence of the mixt., such as is induced, for example, within a gas-engine cylinder during the introduction of the charge. To det. the pressures, mixts. of pure CH<sub>4</sub> with air varying from 6.05 to 13.9% of CH<sub>4</sub> by vol. were fired in two spherical vessels of about 4 and 16 l. The pressures recorded varied from 2.86 atm. for 6.05% CH<sub>4</sub> steadily upward to 6.94 atm. for 9.8% CH<sub>4</sub>. Mallard and Le Chatelier's values, obtained in cylindrical vessels, are higher but rather irregular. W., believing a loss of heat and pressure due to the too gradual attainment of thermal equil., investigated this point. He concluded that a correction of 3% should be applied to his exptl. results. To trace the progress of the flame within the vessels from the time-pressure diagrams, records were taken of the time that elapsed between the passage of an electric spark at the center of a closed vessel containing CH<sub>4</sub> and air and the appearance of flame at a point 7.5 cm. vertically upwards. If it is assumed that the flames in the spheres traveled at the observed mean speeds from the point of ignition, it was found that in the 4-l. sphere no pressure was indicated until the flame traveled 5-5.5 cm. while in the 16-l. sphere flame traveled 9-10 cm. before any pressure was indicated. Therefore over the range 7.5 to 12.5% of CH<sub>4</sub>, where the flame is propagated in all directions at the same speed, about 1/4 of the mixt. had been inflamed in each vessel before any indication of pressure was obtained. The methods of experimentation and calcn. are described and illustrated.

CHARLES E. MUNROE.

GAMBLE, S. G.: How to Deal with Different Kinds of Fires. Red Book No. 201, of the British Fire Prevention Committee, 8 Waterloo Place, London, S. W. 1. 3s. 8d. post free. For review see *Chem. Trade J.* 64, 97 (1919).



**Explosives.** A. J. MARIN. Brit. 121,294, Dec. 5, 1918. In the manuf. of explosives, nitrate or perchlorate of guanidine or nitrate of dicyanodiamidine and trinitronaphthalene are added to explosives containing nitrates, chlorates, or perchlorates and nitro compds. such as liquid di- and trinitrotoluenes. An example contains  $\text{NH}_4\text{ClO}_4$  34 to 32.2, nitrate of guanidine 26 to 24,  $\text{NaNO}_3$  25 to 24.6, trinitronaphthalene 4 to 5.6, and liquid di- or trinitrotoluenes 11 to 13.6%.

**Drying smokeless powder and recovering the solvents vaporized.** L. GATHMANN. U. S. 1,289,150, Dec. 31. In the drying app. employed for driving off volatile solvents from smokeless powder, the drying compartment is so arranged that the atm. and gases from it are caused to flow to a condenser and then through a heater in closed circuit back to the drying chamber. The temp. in the condenser is gradually increased as the drying operation progresses so that in the latter stage of the drying a smaller % of the vapors are condensed than in the earlier stage. This adjustment of temp. causes retention of sufficient moisture in the surface of the explosive grains to prevent their premature hardening.

**Drying nitro compounds and recovering solvent separated therefrom.** WM. C. CRAM, JR. Can. 188,801, Feb. 18, 1919. Warm water is circulated through nitro compds. until the desired amt. of solvent is sepd. and air is passed through the compd. to carry off the aqueous moisture. The wash water is distd. to recover the solvent.

**Match composition.** W. A. FAIRBURN and F. V. D. CRUSER. U. S. 1,290,146, Jan. 7. A compn. for the "safety bulb" of "double dipped" matches is formed of  $\text{Ba}(\text{ClO}_3)_2$  26,  $\text{K}_2\text{Cr}_2\text{O}_7$  24,  $\text{Ba}(\text{OH})_2$  27, glue 12, resin 4, S 2, fillers 14 and  $\text{H}_2\text{O}$  70 parts. The first three ingredients react to form  $\text{BaCrO}_4$  and  $\text{KClO}_3$ .

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**The British dye industry.** ANON. *Nature* 102, 388(1919).—Announcement is made of the amalgamation of the British dye concern, Levinstein's, Ltd., with the Government company known as British Dyes, Ltd. The new Company is to be called the "British Dyestuffs Corpn., Ltd." The outlook of the dye industry in Great Britain is thought to offer much promise. W. H. ROSS.

**Chloramine reactions of proteins.** J. F. BRIGGS. *J. Soc. Chem. Ind.* 37, 447-8R (1918); cf. Raschig, *C. A.* 2, 636; 3, 1533; Cross, Bevan and Briggs, *C. A.* 3, 1213. —All kinds of protein derivatives give the chloramine reaction regardless of their state of complexity and soly. This explains why at certain stages colloidal chloramines may be absorbed from old bleaching liquors by vegetable fibers. It also accounts for the persistent odor which clings to the hands after immersion in hypochlorite soln., and the odors observed in bleached fabrics. The caustic feeling of a neutralized hypochlorite soln. is due to the production of a chloramine and  $\text{NaOH}$ , thus:  $\text{RNH}_2 + \text{NaOCl} \longrightarrow \text{RNHCl} + \text{NaOH}$ . The reaction especially studied was the deposition of gelatin in aq. soln. on cotton yarn and fixing it in the form of an insol. chloramine. Yarn so treated retained the active Cl reaction even after thorough washing. When the gelatin-chloramine is dried in the oven it is decompd. with the evolution of  $\text{HCl}$ . The chloramine reaction serves to detect stains of protein fluids on fabrics, the presence of wool fibers in cotton, and glue or casein in adhesives or coatings. The procedure is to chlorinate, wash, and test with starch and  $\text{KI}$ . The localization of protein in plant tissues can be shown in this way. The questions raised by the author indicate the possibility of a wide field of research in the study of chloramine-protein reactions.

L. W. RIGGS.

**Water softening for textile purposes.** P. E. KING AND E. V. CHAMBERS. *J. Soc. Dyers Colourists* 34, 240-7(1918).—The authors discuss the subject with considerable detail as to processes and chemistry involved. Methods of water softening may be divided into two distinct groups: Group I: (a) the lime process, (b) soda process, (c) combined lime and soda process, which is the method in general use. Group II includes the permutite system. Local water-softening conditions of certain districts in England are discussed, also the wasting of water which by softening and some purification might not only be used again but result in reclaiming of much grease.

L. A. OLNEY.

**Korean ramie.** KASUKE UEDD AND CHUZO HIZUME. *J. Chem. Ind. (Japan)* 21, 1043(1918).—The annual production of ramie (*Bokemia nirei*) in the Orient is 3,500 tons. The fiber is on the av. 0.9 m. long and 0.2-0.6 mm. wide. The chem. analysis of the raw and finished ramie fibers, resp., are: water, 9.93, 10.59; ash, 3.84, 6.59; fiber, 62-65, 67.38; aq. ext., 7.96, 6.94; oils and waxes, 1.04, 0.35; miscellaneous impurities, 14.58, 8.15%.

T. YOSHIOKA.

**Pita fiber from Colombia.** ANON. *Bull. Imp. Inst.* 16, 289-90(1918).—A sample of "pita" fiber derived from the Bromeliaceae was examd. with the result: moisture, 9.8% (expressed on dry fiber), ash, 0.6;  $\alpha$  hydrolysis loss 12.6%,  $\beta$  hydrolysis loss 16.8%, acid purification loss 2.7%, loss on washing in H<sub>2</sub>O 2.1%, cellulose 74.7%. The fiber was of good strength, well decorticated, and could be used as a substitute for sisal hemp, or other hard fibers.

R. L. SIBLEY.

The coloring matter in *Lithospermum erythrorhizon* (KURODA) 10. Soluble oil products for use on textiles (U. S. pat. 1,289,097) 27.

**Dyes.** M. L. ANGEL. Brit. 121,347, Dec. 13, 1917. Condensation products (parazenes) are prepd. by heating 1-amino-4-halobenzene, 1-amino-4-halonaphthalene, or their derivs. substituted in the nucleus by indifferent groups, or mixts. of these compds. with condensing agents, such as ZnCl<sub>2</sub>, FeCl<sub>3</sub>, AlCl<sub>3</sub>, or P<sub>2</sub>O<sub>5</sub>, and oxidizing the products. The product from 1-amino-4-halobenzene is sol. in HOAc, the soln. dyeing wool or silk. The products form salts with acids. Auxochromic groups may be introduced into the mol. of the dyes by the usual methods. The provisional specification mentions alkyl, halo, amino, hydroxy, and sulfonic derivs., and also parazenes containing anthracene or anthraquinone nuclei.

**Colors or mordants.** W. W. COB. Norw. 29,020, Aug. 19, 1918. Colors or mordants are obtained by hydrolyzing banana or like fruit, rind, or stalks, or mixts. thereof. Cf. C. A. 13, 190.

**Solid soluble dye composition.** S. M. TOOTAL. U. S. 1,289,968, Dec. 31. A dye mixt. adapted for molding into the form of wafers or lozenges is formed by dissolving gelatin or glue in an equal quantity of H<sub>2</sub>O, adding ZnO, NH<sub>4</sub>OH or Na<sub>2</sub>CO<sub>3</sub> to neutralize any acidity of the material and boiling and afterward mixing with a dye soln. prepd. by dissolving a dye in glycerol or H<sub>2</sub>O, and again boiling. Dyes of acid, basic or direct character, may be thus prepd., e. g., magenta, erica B or xylene red B.

**Bleaching textile materials.** A. E. JURY. U. S. 1,289,803, Dec. 31. In bleaching textile materials, the material is first treated with a bleaching substance and an inorg. acid, e. g., H<sub>2</sub>SO<sub>4</sub> and CaOCl<sub>2</sub>, then with an alk. soln. such as borax or Na<sub>2</sub>CO<sub>3</sub> to neutralize the acid remaining in the material and finally with an org. acid such as HOAc to neutralize the excess alkali used.

**Keir for bleaching textile materials.** G. B. FLOOD. U. S. 1,290,156, Jan. 7. The pat. relates to structural features of a bleaching-keir, and to a method of circulating liquid through it.

**Sizing yarn or thread.** E. W. SNYDER. U. S. 1,290,795, Jan. 7. Ocotillo gum is used as a sizing on thread or yarn.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**Methods of varnish analysis.** W. T. PEARCE. *J. Ind. Eng. Chem.* 11, 200-1 (1919).—Varnishes of varying compn. were made in the lab. and then analyzed by the method of Boughton (*C. A.* 10, 1277), Darner (*C. A.* 9, 1696), Twitchell, and Scott. Boughton's method gave satisfactory results for resins and oils, and McIlhiney's method (*C. A.* 2, 2630) for rosin. Analyses are tabulated. F. A. WERTZ.

**Preservative coating for iron or steel.** N. J. PORTER. U. S. 1,289,537, Dec. 31. Fe or steel is first given a coating of a bituminous material such as a bituminous paint, and over this there is applied a hot plastic mineral rock asphalt coating. The surface of the latter is roughened before it has set to a hard solid form and there is then applied a top coating formed of  $MgO$  and  $MgCl_2$ . This composite coating is elastic, impervious and resilient and adheres to the metal without the use of cleats or other mechanical means of attachment.

**Paints, varnishes, linoleum, etc.** A. A. LOCKWOOD and M. R. A. SAMUEL. Brit. 121,237, Mar. 14, 1918. In order to obtain products for use in the manuf. of paints, varnishes, linoleum, etc., fatty acids or their metallic salts, *e. g.*, ferrous linoleate, are treated with a soln. of a borate, preferably borax or Ca borate or other alk.-earth borate. The products are oxidized with or without driers. The operation may be effected by mixing the fatty acid, etc., with a borate soln., either in the cold or at temps. up to boiling. A current of air is used for oxidizing the mixt. Any of the usual paint materials, such as litharge and metallic salts, are added to the product. In order to use borates of Pb, Mn, etc., as driers, the fatty acids are mixed with acetates or other sol. salts of these metals, the mixts. being agitated and treated with air. The acetate is then converted into borate by the addition of borax soln., the agitation and treatment with air being continued. In this modification, the addition of borate soln. may be omitted if the fatty acid has been previously treated with borate soln. in sufficient quantity.

**Stenciling paper.** W. G. FUERTH. U. S. 1,289,725, Dec. 31. Stenciling sheets are formed of Yoshino paper coated with fish-isinglass hardened with dil.  $CH_3O$  soln. A backing sheet for use with this paper is formed by coating rope manila or similar paper with a mixt. containing linseed oil and kaolin or similar unctuous earthy material. When the paper is to be used for stenciling, the backing sheet is coated with a softening mixt. composed of Turkey red oil 1, glycerol 2,  $H_2O$  4 and 5%,  $CH_3O$  soln. 1 part, and the Yoshino paper is placed upon the coated backing and allowed to become softened and the two sheets are inserted together in a typewriter to produce the stencil. Instead of  $CH_3O$ , dichromates, or other hardening agents may be used.

**Indelible ink.** L. JEANMAIRE. U. S. 1,289,793, Dec. 31. An indelible ink suitable for use on paper or cloth is formed of ext. of logwood 4 oz.,  $K_2Cr_2O_7$  10 grains, alum a half oz., a soln. of nut galls 60 drops, gum arabic 1 oz.,  $AgNO_3$  2.5 drams, and  $H_2O$  1 pint. The first three and last three (of the first-named six) ingredients are separately dissolved in  $H_2O$  and the 2 solns. are then combined with each other.  $Na_2CO_3$  may be used on cloth as a mordant for the ink.

**Copying documents.** F. DOREL. Brit. 121,274, Sept. 2, 1918. A gelatinous compn. for use in the reproduction of drawings, maps, plans, or other line documents, is

rendered white by the addition of a suitable substance, so that the inked design is readily visible and imperfections in the inking are more easily rectified. The white substance, such as baryta or kaolin, may be merely mixed with the gelatin or may be produced in the compn. in the form of a white ppt., such as that of  $\text{BaSO}_4$  or  $\text{PbCO}_3$ . A metallic salt, such as  $\text{FeSO}_4$ , is added to the gelatin as usual, and glycerol, formal, or alums may also be added. A suitable compn. is prepared by adding successively to a soln. of 100 g. of gelatin in 200 g. of  $\text{H}_2\text{O}$ , the following hot solns.; (1) 70 g. of  $\text{Na}_2\text{SO}_4$  in 100 g. of  $\text{H}_2\text{O}$ ; (2) 40 g. of  $\text{BaCl}_2$  in 80 g. of  $\text{H}_2\text{O}$ , and (3) 1.5 g. of  $\text{FeSO}_4$  in 20 g. of  $\text{H}_2\text{O}$ .

**Polish for varnished surfaces.** J. G. BRIGGS. U. S. 1,289,103, Dec. 31. A compn. for polishing varnished surfaces is formed of beeswax 3, rosin 1, gum camphor 1, turpentine oil 5 and benzine 1 part. Coloring matter also may be added.

## 27. FATS, FATTY OILS AND SOAPS.

F. SCHREUBEL.

**The analysis of palm fat in the laboratory of the Public Experiment Station of the A. V. R. O. S.** F. C. VAN HEUIN. *Meded. van het Alg. Proefstat. der A. V. R. O. S., Algem. Serie* No. 2, May, 1918; *Chem. Weekblad* 15, 1394-5.—The most important detns. in the analysis of palm fat are: foreign matter, moisture and acid no. For moisture the distn. method is much to be preferred to drying at  $105^\circ$  unless there is less than 4%. Foreign matter is best detd. by dissolving the fat in hot petroleum and filtering through a Gooch crucible. Detailed directions are given for detg. the acid no. The oil should be made by heating the nuts before removing from the shell. The fermentation process, sometimes used, yields an inferior oil with a high acid no. JULIAN F. SMITH.

**Shark and ray liver oils.** MITSUMARO TSUJIMOTO. *J. Chem. Ind. Japan* 21, 1015(1919); cf. *C. A.* 12, 1004.—The liver oils are from fish caught in Japanese waters. T. confirmed the following: (1) The shark liver oils having low sp. gr. without exception contain the unsatd. hydrocarbon squalene ( $\text{C}_{30}\text{H}_{48}$ ). (2) Liver oils from some sharks not in the family *Squalidae* also contain considerable amt. of squalene. (3) The oil from the eggs of sharks likewise contains squalene. (4) The liver oil from ray and that from *Chimaera phantasma* contains no squalene. *Pristurus pilosus* produces liver oil contg. 80% of squalene—an extremely high amt. of hydrocarbon.

T. YOSHIOKA.

**Myrtle wax of South America.** ANON. *Bull. Imp. Inst.* 16, 3, 287-9(1918).—The berries of several species of *Myrica* are covered with a layer of hard wax which can be extd. by boiling the berries in  $\text{H}_2\text{O}$  and skimming off the wax which rises to the surface. This wax, when examd., showed: m. p.  $45^\circ$ , solidifying point of fatty acids  $46.4^\circ$ , acid value 21.2, sapon. value 2.167, I value 1.03%, unsaponifiable matter 0.4%. The berries are collected when they assume a light gray color, as then the yield of wax is higher and the wax is of a yellower color than when the berries are fully ripe. The wax contained 0.06% ash, and 0.31% moisture.

R. L. SIBLEY.

**Oil-filtering apparatus** (U. S. pat. 1,290,820) 1.

**Soluble oil products for use on leather or textile materials.** R. BOEHRINGER. U. S. 1,289,097, Dec. 31. Sol. products adapted for use as a substitute for Turkey red oil and other sol. oils in treating leather or textile materials, are produced by treatment of mixts. of resins and animal or vegetable oils with  $\text{H}_2\text{SO}_4$ . In one method of carrying out the procedure, 25 lbs. ground rosin is slowly added to 25 lbs. corn oil fatty

acids previously heated to about 90° and the mixt. is stirred until the rosin has completely dissolved. The soln. is then cooled and 50 lbs. of corn oil is added followed by the gradual addition, with const. stirring, of 25 lbs.  $H_2SO_4$  (66° BÉ.). Care is taken that the temp. does not rise above 35° and the mixt. is allowed to stand for 24 hrs. or until a test shows that it is sol. in  $H_2O$  (in the form of its alkali metal salts). The same treatment may also be applied to castor oil, cottonseed oil, bean oil, lard oil, cod oil, fish oils, tallow or other animal or vegetable oils or fats, and to copal, dammar, amber and other resins. The sulfonation of a mixt. of oil and resin produces a more limpid product than sulfonation of an oil alone.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Some methods for the determination of the true sucrose content of molasses. T. VAN DER LINDEN. *Meded. v. h. Proefst. v. d. Java-suikerindustrie, Chem. Serie* No. 6, 1-24; *Arch. v. d. suikerindustrie v. Ned.-Indië* 1917, 1249-72; *Chem. Weekblad* 15, 1363-4(1918).—The principal methods of sucrose detn. now in use are discussed. None of the newer methods is to be preferred to the inversion method of Steuerwald, which is prevalent in Java. In some cases a combination of this with the Pellet method may be advantageous.

JULIAN F. SMITH.

The crystal balance and the figure "probable loss in molasses." F. LEISTRA. *Meded. v. h. Proefst. v. d. Java-suikerindustrie, Chem. Serie* 1917, No. 4, 1-8; *Chem. Weekblad* 15, 1362-3(1918).—The crystal balance, a special form of sucrose balance, measures sucrose only as such; but it does not indicate the form of the loss. Some indication can be gained by comparison of "probable loss" with actual loss. The crystal balance is accurate only for mechanical losses, not for chem. losses. The relations between capital loss and sucrose loss, and between probable and actual loss, are formulated and discussed.

JULIAN F. SMITH.

HARRIS, F. S.: *The Sugar Beet in America*. New York: The Macmillan Co. \$2.25.

MARTINEAU, GEORGE: *Sugar from Several Points of View*. London: W. M. Clowes & Sons.

Decolorizing-carbon from kelp. F. W. ZERBAN. U. S. 1,290,002, Dec. 31. Kelp is dried and carbonized, and C produced is heated to a high temp., (preferably to redness) and then cooled and washed with  $H_2O$  for the removal of the K salts present, and thereafter washed successively with acid, e. g., HCl, and with  $H_2O$ . The product thus obtained is suitable for use in decolorizing sugar solns. The patent is "dedicated to the public" for free use.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

Determination of moisture in leather. C. D. WILKINSON. *J. Soc. Leather Trades' Chem.* 2, 132-3(1918).—For moisture in leather better agreement and more correct results would be obtained by drying to const. wt. than by the present method of drying for 2 hrs. in a sufficiently high vacuum. The vacuum is not always the same and the amt. of moisture driven off consequently varies. For 2 hrs. drying at 98-100° at 700 mm. vacuum 13.01% moisture was obtained while at 500 mm. vacuum only

11.92% was found. When dried to const. wt. the figures were 13.48 and 13.41%, resp., for the above vacuums. In a note by the editor it is stated that no doubt higher results in moisture can be obtained by drying for a longer time than the 2 hrs. prescribed but that the present method is a compromise. Wilkinson's results show that it is important to keep the vacuum up to at least 700 mm. and it may prove desirable to increase the time of drying 1 hr. The attention of other chemists is called to the matter with the object of securing more data.

R. W. FREY.

**Titration and estimation of tannin with iodine.** F. T. LEE. *J. Soc. Leather Trades' Chem.* 3, 8-10(1919).—Difficulty in obtaining during the war pure indigo carmine for Löwenthal's method of tannin analysis led L. to experiment with other oxidation methods. A modification of Jena's I method was developed. The tannin is oxidized by 0.02 *N* I soln., the excess of which is titrated back with 0.02 *N* thiosulfate, using starch as an internal indicator. Five cc. of the filtered tannin soln., provided the soln. does not contain more than 1 g. tannin per l., are added to 25 cc. I soln. and allowed to stand for 20 mins. in a stoppered bottle. The back titration is carried out until the blue color is discharged for at least 30 secs. The oxidation figure for the non-tannin soln. must be likewise detd. and also the gallic acid figure. Five cc. of a 0.1% soln. of pure gallic acid were found by numerous titrations to absorb 4.1 cc. 0.02 *N* I soln. An example is given showing the method of calcg. the % tannin. The cc. of I absorbed by the tannin from 5 cc. of the soln. (difference between sol. solids and non-tannin titrations) is divided by 4.1 (gallic acid figure). The quotient when multiplied by the corresponding conversion factor given in Procter's L. C. P. B. gives the g. tannin per l. Results on mimosa and myrobolans by both the I method and the official method of the S. L. T. C. are in good agreement. Also in *J. Am. Leather Chem. Assoc.* 14, 114-6(1919).

R. W. FREY.

**Note on the statement of basicity of chrome liquors.** J. R. BLOCKEY. *J. Soc. Leather Trades' Chem.* 3, 11-13(1919).—The numerous methods of expressing the basicity of chrome liquors cause much confusion. Some decision should be made as to the best method for universal adoption. The European method expresses the basicity as parts  $\text{SO}_4$  to 52 Cr, while the American system uses the expression  $\text{Cr}_2\text{O}_3 \div \text{SO}_4$ . A method, believed to have been suggested by Kopecky, which defines basicity as parts NaOH required to neutralize 152 parts  $\text{Cr}_2\text{O}_3$  is used in some places. Procter (*C. A.* 13, 526) has suggested another method based on the ratio of basic to acid valencies. A very convenient arrangement in graph form shows the relationship between basicities by these various methods. The objections to the different methods are pointed out somewhat in detail. It is suggested that a method based on the number of OH groups attached to Cr, includes most advantages. Normal salts would be represented by 0,  $\text{Cr}_2(\text{OH})_2\text{SO}_4$  by 2,  $\text{Cr}_2(\text{OH})_4$  by 6, and so on. Thus the more basic the salt the higher the figures. Acid salts could be designated by minus figures, and small variations by fractions or decimals. Thus 2.5 would immediately call to mind a salt midway between  $\text{Cr}_2(\text{OH})_2\text{Cl}_4$  and  $\text{Cr}_2(\text{OH})_4\text{Cl}_4$ . The system gives a clear idea of the constitution of the salt, is independent of the acid radical, and can without modification be applied to Al and Fe salts. The formula for calcg. the basicity by this scheme is given.

R. W. FREY.

**Economy of lactic acid.** HENRY R. PROCTER. *J. Soc. Leather Trades' Chem.* 2, 121-2(1918).—Economy and the use of substitutes should be practiced as much as possible for those org. acids such as lactic, acetic, and butyric which are produced by the fermentation of foodstuffs. Formic and oxalic are the only other org. acids practically available. Of the inorg. acids  $\text{H}_3\text{BO}_3$  and  $\text{H}_2\text{SO}_4$  are suitable. The latter, if made by burning S, is very cheap and deserves more attention. If org. acids must be used in deliming a great saving can be effected by regenerating them in the used liquors

by the addition of  $\text{H}_2\text{SO}_4$ . Starting with the calcd. quantity of org. acids the liquors are subsequently mended by adding  $\frac{1}{4}$  of the calcd. amt. of  $\text{H}_2\text{SO}_4$  and  $\frac{1}{4}$  of the acid originally used. This may be repeated until the liquors become too foul. If this procedure is used with  $\text{H}_3\text{BO}_3$ , only 2 or 3 successive additions should be made before discarding,  $\text{H}_2\text{SO}_4$  is best used in about 0.5 *N* strength and run away each time. For improving the plumping power of liquors substitution for lactic acid is not easy. Mineral acids are generally not satisfactory. Formic and oxalic acids can with certain precautions be used.  $\text{H}_2\text{SO}_4$  in moderate quantities may be safely used but  $\text{H}_3\text{BO}_3$  must not be employed as it produces soft and light-weight leathers.

R. W. FREY.

Soluble oil products for use on leather (U. S. pat. 1,289,097) 27.

MOCK & BLUM: List of United States, British and German Patents Covering the Manufacture of Leather Substitutes. New York: Mock & Blum, 220 Broadway. 51 pp. \$25.

**Tanning with carbazolesulfonic acids.** E. SCHWARZ and L. BLANGEY. U. S. 1,289,280, Dec. 31. A tanning soln. is prepd. by dissolving 70 parts of Na carbazole-monosulfonate in 1000 parts of  $\text{H}_2\text{O}$  and acidifying with 70 parts of 10%  $\text{H}_2\text{SO}_4$ . Delimed hides, which may have been treated with a bisulfite soln., are immersed in this soln. until thoroughly tanned. The leather thus formed is washed and fatted as usual. The tanning may be similarly carried out with other carbazolesulfonic acids, *e. g.*, carbazole disulfonic acid or the mixt. of sulfonic acids obtained by sulfonating pure or crude carbazole or the anthracene waste products obtained by purifying crude anthracene, or sulfonic acids of chlorocarbazole or *N*-methylcarbazole.

**Tanning.** R. B. COCK and W. W. WILLIAMS. Brit. 121,325, Dec. 7, 1917. Hides are tanned in a soln. containing  $\text{Na}_2\text{S}_2\text{O}_3$ ,  $\text{Al}_2(\text{SO}_4)_3$ , vaseline or equiv. mineral product, glycerol or lanoline, tanning ext. of myrobalans, gambier, quebracho, and mimosa, and turpentine. The process may be carried out either in a rotating drum or in pits provided with agitating means. When the drum is used, the hides are first treated with the tanning ext. mixed with turpentine, and then the other four ingredients are added. In employing the pits, the treatment is started with the tanning ext., and then a mixt. of the other five ingredients is added at suitable intervals, the hides being transferred from pit to pit, which successively contain stronger solns. The hides, in each case, are afterwards immersed in a mixt. of tanning ext. and a tanning liquor, and then rinsed, piled, oiled with a sulfonated oil, and shedded.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

**Depolymerization of raw rubber.** K. KAWAKAMI. *J. Chem. Ind. (Japan)*; *India Rubber World* 59, 141 (1918).—A criticism of the work of S. Takeuchi (*cf. C. A.* 12, 1351).

JOHN B. TUTTLE.

**Use of hydrometers on rubber estates.** J. C. HARTJENS. Mededeelingen van het Proefstation Malang, *Bull.* 23; through *India Rubber World* 59, 162 (1918).—Since the relation between sp. gr. and the rubber content is influenced by the tapping system as well as many other factors, Eaton's tables cannot be considered reliable for general use. Trial coagulation gives the smallest error, and this method is much to be preferred to the use of such instruments as metrolacs, latexometers, etc.

JOHN B. TUTTLE.

**Production of guayule rubber.** H. C. PEARSON. *Commerce Reports* 1918, 149; *India Rubber World* 59, 244-6, 289-91(1919).—A review of the attempts to cultivate *Parthenium argentatum*, the shrub from which guayule rubber is obtained. Figures are given showing the av. rubber content of the various parts of the plant. By judicious crossing of stocks, the yield and quality of the rubber have been greatly increased.

JOHN B. TUTTLE.

**Tentative specifications for insulated wire and cable: 30% Hevea rubber: D27-16** T. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 650-63(1918). **Appendix I.** Extracts from standardization rules of the American Institute of Electrical Engineers. (Edition of July 1, 1915.) *Ibid* 662-3. **Appendix II.** Joint rubber insulation committee procedure for the analysis of rubber compound. *Ibid* 664-75.—Specifications covering conductors and rubber insulation are given in full detail and include methods of manuf. and chem. and phys. tests. Appendix I gives standards for cond. of Cu, high-voltage test (a) frequency and (b) rate of increase of voltage, also insulation resistance tests. Appendix II gives detailed methods for chem. analysis of rubber-insulation compds.

D. F. CRANOR.

**Tentative specifications for rubber belting for power transmission: D53-18T.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 676-80(1918).—These specifications cover two classes of rubber belting for transmission, viz.: (1) rubber-covered, (2) friction-covered, and include (1) manuf., (2) phys. properties and tests, (3) sizes, (4) marking, and (5) inspection and rejection.

D. F. CRANOR.

**Tentative specifications for steam hose: D54-18T.** ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 681-4(1918).—These specifications cover wrapped steam hose, suitable for steam heat connections when the steam pressure does not exceed 125 lb. per sq. in. Specifications include (1) manuf., (2) phys. properties and tests, (3) sizes and dimensions, (4) workmanship, (5) marking and (6) inspection and rejection.

D. F. CRANOR.

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**Physiological function of the latex in *Hevea brasiliensis* (BOBILJOFF) 11D.**

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**Joining rubber surfaces by vulcanization.** J. L. MAHONEY. U. S. 1,289,776, Dec. 31. The pat. relates to manipulation of the edges to be joined, by stretching and compressing during the vulcanization. U. S. 1,289,777 relates to a similar process.

**Composite articles of metal and vulcanized rubber.** A. A. SOMERVILLE and M. J. RENTSCHLER. U. S. 1,289,566, Dec. 31. In the manuf. of rubber articles trimmed with metals, avoidance of tarnishing of the metal is accomplished by the use of a rubber mixt. free from S. The vulcanized rubber used may, e. g., be composed of rubber 100, flake Al oxide 100, PbO 100 and dinitrobenzene 2 parts. Other nitro compds. of the aromatic series may be used and the rubber compn. is suitable for use with metals such as brass, Cu, steel, Au or Ag.

**Rubber-like material from pinene.** L. GOTTSCHALK. U. S. 1,289,444, Dec. 31. Com. turpentine is freed from resin and the pinene obtained is heated with HCl, HOAc or other acid at a temp. of about 225-40° and mixed vapors thus evolved are passed through a metal tube maintained at a temp. of about 250° to convert the pinene into limonene. In another portion of the tube, the converted vapors are heated to about 300° or higher and maintained at this temp. until a portion of the material has been converted into a substance of rubber-like properties. The products are condensed, the acid is sep'd. and by-products are distd. off and the rubber-like residue is dried in the air at a temp. of 85° or lower. It is stated that the rubber-like material thus produced may be dissolved in benzine and generally used in the same manner as rubber.



# CHEMICAL ABSTRACTS

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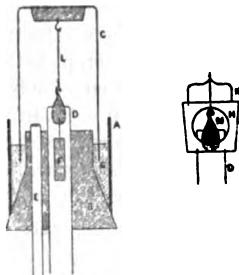
## I. APPARATUS.

L. C. JONES.

Services rendered to the chemist by the blown glass apparatus of H. Vigreux. E. HILDT. *Ann. chim. anal. chim. appl.* 1, 13-5(1919).—A review. F. W. S.

The permanent marking of glass vessels. JOSEPH C. BOCK. *J. Am. Chem. Soc.* 41, 359-61(1919).—The use is proposed of glass color fused in the glass by means of an ordinary burner. E. J. C.

Gas pressure governor for one Bunsen burner. G. R. CLARE. *J. Soc. Chem. Ind.* 38, 387(1919).—The app. described was designed for the purpose of controlling the gas pressure to a single Bunsen burner without affecting the pressure on the others. It has been operating satisfactorily for several months, the pressure being controlled to 1.5 in. water column. It is shown in the accompanying figure. *A* is a brass tube 2 in. inside diam., 2 in. long, *B* a rubber stopper 2.25 in. diam., 2 in. long, *C* an ordinary glass weighing bottle,  $\frac{5}{16}$  in. diam., 3 in. long; *D* the gas inlet tube  $\frac{1}{16}$  in. diam. (containing the valve); *E* the gas outlet tube  $\frac{1}{16}$  in. diam., *F* a Pb weight fastened to the valve by a Pt wire to prevent the valve from sticking because of occasional high pressure; and *G* is a Hg seal. *H* is a  $\frac{1}{8}$  in. cork fixed on to the gas inlet tube *D* and holding a glass tube *K* drawn out to a small hole which serves as a guide for the wire *L*. The gas passes from *D* into the bell *C* through the hole *M*.



The required controlled pressure can be varied by means of the weight *F* or by placing an additional weight centrally on the top of the bell. The length of the wire (0.02 in. thick) must be detd. by expt. J. L. WILEY.

Rapid method of calibrating a stand pipet. ANON. *Gas World* 69, 399(1918).—The pipet is made from an ordinary one, having a portion of the lower tube cut off and a side arm blown on to the remaining part connecting with the bottle containing the soln. to be used. It is required to calibrate the lower tube in such a way that the amt. of liquid run out between the upper and lower calibrations will equal the stated vol. of the pipet. The pipet is clamped in an upright position and the side arm closed. A suitable jet with a rubber connector closed by a clip is fixed to the lower end. The pipet is then filled with standard acid, and the acid run down to the upper mark. Standard alkali soln., exactly equiv. to the standard acid soln., is delivered from an accurately calibrated pipet of the same vol. into a flask and two drops of methyl orange soln. are added. The acid from the pipet is then run in very slowly until the end-point is reached, when the position of the liquid in the lower part of the pipet denotes the mark required. J. L. WILEY.

Apparatus for growing crystals under controlled conditions. J. C. HOSTETTER. *Geophys. Lab. J. Wash. Acad. Sci.* 9, 85(1919).—For growing crystals suitable for pressure studies, an app. is required in which all variables affecting the rate of growth are under control. Such variables are: (1) the degree of supersatn. in the mother

liquor which at any time det. the increment of growth; therefore, temp. and evapn. which affect supersatn. must be under definite control; (2) the direction of concn. currents; (3) the number of crystals which serve as nuclei for growth; and (4) a definite circulation of the supersatd. soln. over the nuclei to be developed. Neglecting the effects of hydrostatic pressure, there are 4 methods of producing supersatn. in a satd. soln. and hence growth of a crystal immersed therein: (1) lowering (or in rare cases raising) the temp., (2) allowing the soln. to evap., (3) dissolving in this soln. held at const. temp. extremely finely divided particles of the cryst. phase, or (4) adding another solvent in slight amt. The first method is the easiest to control and the app. described is based on this principle. The app. consists of 2 thermostats connected by tubes, with the necessary stirring and circulating devices, and filled with a satd. soln. of the crystals to be studied. One thermostat, the saturator, contains the crystals, which maintain the soln. satd.; the other, the crystallizer, is held at a slightly lower temp. and it is in this cell that growth takes place. Heating is maintained in each cell by a 5-c. p. cylindrical C lamp operated through relays by thermoregulators filled with Hg. The satd. liquid is pumped from the saturator into the crystallizer where the excess material is deposited on small crystals, originally placed there as nuclei, after which the soln. is returned to the saturator. The degree of supersatn. of the soln. entering the crystallizer can be controlled by adjusting (1) the temp. difference between the saturator and the crystallizer, (2) the rate of circulation between the 2 thermostats, and (3) the temp. and the rate of flow of the cooling water in the coils which serve as a water jacket for the tube connecting the saturator with the crystallizer. The difference in temp. between the saturator and crystallizer that is permissible depends upon the change of soly. with temp., and especially upon the extent to which the soln. of a particular salt can be supersatd. As regards the effect which the number of nuclei has upon the rate of growth, it was found in one instance that with a temp. difference of 0.3-0.5° and 5 nuclei present the rate of growth for potash alum was about 1 mg. per hr. per sq. cm. of crystal surface exposed to the soln.

J. L. WILEY.

**Determining zero reading on an Ellison gage.** HERMAN BACHARACH. *Chem. Met. Eng.* 20, 246(1919); cf. Anderson, *C. A.* 13, 85.—An instrument is shown comprising a gage properly connected and mounted on a board ready to attach the pressure leads. It provides for getting the zero reading at any time in a permanent installation by using the proper valve and pipe connections instead of rubber tubing and a clamp. A scheme is also shown of connections where several differential pressures can be detd.

J. L. WILEY.

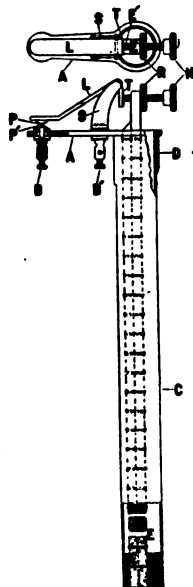
**Bibliography on pyrometers.** R. HADFIELD. *Trans. Faraday Soc.* 13, 362(1918).  
E. J. C.

**Electro-thermoregulator for water baths.** CHESTER I. HALL. G. E. Co., Fort Wayne, Ind. *Science* 49, 214-5(1919).—Attention is called to "G. E. Thermostatic Metal," a product now on the market. This is a ready made "extremely sensitive" bi-metallic strip, making a metallic thermometer suitable for a wide variety of uses, of which the regulation of water baths is only one. The material, if thin, may be made to give a motion of 6 mm. per degree; if thick, it will give a pressure of 100 g. per degree. It may be obtained from 0.13 mm. to 6 mm. thick, up to 15 cm. wide and 90 cm. long.

W. P. WHITE.

**An electro-thermoregulator for water baths.** C. H. OTIS. *Science* 48, 425-6(1918).—The majority of electro-thermostats so far devised and in use in paraffin ovens, incubators and control chambers, operate directly in the chamber itself. Such installation has its disadvantages in that the regulator is subjected to sudden variations of temp. whenever the door or compartment is opened, thus interfering with the stability and accurate operation of the app., causing an unnecessary no. of makes and breaks

with attendant corrosion of contact points. It is also conducive to fluctuations in the temp. caused by the unnecessary heating and slow cooling of the heating element. The app. described is designed to be inserted in the tubulature of the incubator, where it is immersed in the water of the water-jacket. It is intended to be used in connection with a secondary switch in circuit with an elec. heating element, in which case and with a moderate current passing through the primary circuit the thermostat will give continuous control within a fraction of a degree of the specified temp. The thin brass casing *C*, 29.5 cm. long by 2.5 cm. outside diam., is strengthened at its upper end by a collar, *D*, which extends on one side to form a rigid arm, *A*. *B* and *B'* are binding posts for wires leading to the secondary switch placed in some out-of-the-way position. They are insulated from the arm *A* by red fiber compn. *B'* is bolted to a curved saddle-piece, *S*, in which is suspended a bent lever, *L*. Pt points *P* and *P'* of generous size are soldered to *B* and *L*, resp., while a No. 3 cover glass *T* is cemented with hard shellac to the vertical arm of *L*, insulating it from the rest of the mechanism. The thermostat operates on the thermocouple principle. Zn and Fe make a sensitive combination; but Pb and Fe, Al and Fe, Cu and Fe, and other combinations, can be used, except that there is a loss of sensitiveness in the order given. Two strips *E* and *E'*, each 9 mm. wide by 6 mm. thick, are riveted together and imbedded in solder *V* at the bottom of the casing. A screw *N* and locknut *R* provide means of adjustment. This method of construction makes a rigid column which is not subject to vibration. In practice, the casing is filled with glycerol, which increases the continuity of parts and prevents corrosion of the metallic couple. The advantages are: (1) the generous length of the metallic couple insures a max. of sensitiveness; (2) this sensitiveness is increased by the mechanical advantage of the lever; (3) continued movement of the bimetallic column in either direction imposes no strain upon any part of the app. and makes accurate control possible with least adjustment for long and continuous periods of time.



J. L. WILEY.

**Acetylene generator.** H. NASH. U. S. 1,291,604, Jan. 14.

**Apparatus for concentrating vinegar and acetic acid.** E. KLEIN. U. S. 1,291,025, Jan. 14.

**Coating wooden receptacles with waste sulfite liquor constituents.** G. T. BLOOM. U. S. 1,291,696, Jan. 14. The inner surfaces of wooden receptacles are coated with concd. waste sulfite liquor or sulfite pitch of a sp. gr. of approx. 1.18, which has not been neutralized. The partly dried elastic coating thus formed renders the vessels suitable for holding oils.

**Distilling apparatus for benzene, oils, etc.** G. E. WALKER and S. H. WALKER. Brit. 121,748, Dec. 9, 1916. App. for the fractional distn. of crude benzene, oils, etc., consists of two or more stills arranged at different levels so that the liquor flows through them in succession by gravity, and which are heated to successively higher temps., each still comprizing a multitubular boiler surmounted by a fractionating column. The last and lowest still in the series is heated by steam, etc., and the preceding stills are heated either by steam or by vapors coming from the adjacent stills of higher temp. The crude liquid is preheated in a supply tank by vapors from the first of the descending series of stills. The distillates are condensed in coils. The stills may also be heated by steam coils in the liquor chambers above and below the heaters. The steam used

for heating purposes may flow through the stills in succession from the lowest to the highest in the series.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

**The molecular weight of some salts dissolved in urethan.** G. BRUNI. *Gazz. chim. ital.* 48, II, 39-42(1918).—Stuckgold (*C. A.* 12, 876) states that urethan is a strong dissociating solvent and bases his statement on cond. detns. and on cryoscopic measurements. S. had apparently overlooked the earlier work of Castoro (*Gazz. chim. ital.* 28, II, 317(1898)) and B. and Manuelli (*Z. Elektrochem.* 1904, 601) who found the mol. wt. of  $MnCl_2$ ,  $CoCl_2$  and  $CuCl_2$  normal except for  $MnCl_2$ , which was 10% too low. S.'s results with KI in comparison with  $NH_4I$  and  $RbI$  seem strange and so B. has repeated the detns. at higher concns. and has found that the degree of dissociation  $\alpha$  as detd. by S. is much too high. B. found  $\alpha$  to be 0.10 which is very nearly the same as for  $MnCl_2$  (0.11). S.'s results with Li salicylate are also criticized.

E. J. WITZEMANN.

**The heat capacity of electro-positive metals and the thermal energy of free electrons.** GILBERT N. LEWIS, E. D. EASTMAN AND W. H. RODEBUSH. *Univ. Calif. Proc. Nat. Acad. Sci.* 4, 25-9(1918).—According to the principle of equipartition of energy the sp. heat of a solid at const. vol. per g. atom should be  $3R$  or 5.97 cal. per degree. This principle is a limiting principle and is more nearly approached in practice the higher the temp., the heavier the atom, and the weaker the constraints operating upon the atom. At high temps., however, the observed atomic heat at const. vol. for K, Na, Ca and Mg is greater than  $3R$ , and is greater in each case than that calcd. from the regular curve which fits the exptl. results at low temp., and which holds for less electro-positive elements such as Al and Cu. Also, this difference from the theoretical curve is greater for K than for Na, and greater for Ca than for Mg. These deviations of the observed from the theoretical heat capacities in the more electro-positive elements are regarded as representing the heat capacity of the more loosely bound electrons. Since at a given temp. deviations from the equipartition principle occur to an extent which is greater the lighter the particle, and the more rigid the constraint which holds it to a fixed position, then it follows that at a temp. at which other particles are gaining thermal energy approx. according to the equipartition law, the electron which is the lightest of all particles will acquire very little energy unless bound by very weak constraints. A high degree of electronic freedom in the pronouncedly electro-positive metals is also indicated by many other properties. The study of heat capacities thus offers a new method of investigating the freedom of electrons in a metal. Exptl. methods and the sp. heat data will be published in the *J. Am. Chem. Soc.* R. H. LOMBARD.

**Electron theory of passivity.** S. DEAN. *Am. J. Sci.* 47, 123-5(1919).—From Langmuir's expression for contact potential between metals (*C. A.* 11, 2304)  $V_1 - V_2 = P_2 - P_1 + (N_1/N_2)$ , where  $P_1$  and  $P_2$  are the "electron affinities" and  $N_1$  and  $N_2$  the electron concns., D. explains the "ennobling" of metals by a decrease of electrons in the surface layer. Oxidation is in effect a removal of electrons. A brief mathematical analysis serves to indicate the effect of magnetization on passivity observed by Byers and Darrin (*C. A.* 4, 1933) and shows in general why the effect is greater in the metals of the iron group. F. C. HOYT.

**A formula giving the heat of vaporization of a liquid.** E. ARIÈS. *Compt. rend.* 168, 204-7(1919).—A derivation depending on relations deduced from the Clausius equation in earlier work. Cf. *C. A.* 11, 556. R. E. HALL.

The accurate determination of surface tension, specific weight, and of electrical conductivity at very high temperatures. F. M. JÄGER. Univ. de Groningue. *Rev. gén. sci.* 30, 5-17(1919).—A review of the author's and his student's work at temps. —80 to 1650°. See *C. A.* 8, 1539; 9, 738-740, 2024, 3010; 10, 2545; 11, 414; and 12, 875, for the surface-tension methods and data. The difficulties to overcome in the measurement of cond. at high temps. consist in (1) deformation of container and electrodes because of thermal dilatation of the materials; (2) impurities incurred by reactions between container and liquid salts at high temps.; (3) contact resistance between electrode and electrolyte; (4) variable and unequal distribution of temp. in the electrolytic app. due to lack of symmetry and too great vol. The app. employed for the resistance measurements is of the form ordinarily employed in cond. measurements of precision. In the elec. furnace, the container, of Ir-free Pt, serves as one electrode, and is in the form of a hemisphere with a cylindrical prolongation. The other electrode is sym. in form, but much smaller. Both are platinized. Identical adjustment of the electrodes is obtained in every case by exactly centering them and making their relative vertical position the same by sighting across the edges with a telescope. The resistance capacity  $C$  can be calcd. at any temp. by the formula  $C = (1/0.8686\pi h) \log_{10} [R(r + h)/r(R + h)]$ , in which  $R$  is the radius of the larger electrode,  $r$  of the smaller, and  $h$  the height of the cylindrical part covered by the liquid. Calcd. and exptl. values of  $C$  are in fair agreement. Measurements have been made upon the nitrates of K, Na, Li, Rb and Cs between 310 and 560°; upon KF, KCl, KBr, and KI between 690 and 975°; and Na tungstate and molybdate between 710 and 1505°. If  $\kappa$  is sp., and  $\mu$  is mol. cond., for KF at 863°,  $\kappa = 2.948$ ,  $\mu = 90.01$ ; 975°,  $\kappa = 3.952$ ,  $\mu = 125.6$ ; KCl, at 861.6°,  $\kappa = 2.592$ ,  $\mu = 131.2$ ; at 943.5°,  $\kappa = 2.954$ ,  $\mu = 154.6$ ; KBr, 868.6°,  $\kappa = 1.904$ ,  $\mu = 112.7$ ; KI, 814°,  $\kappa = 1.438$ ,  $\mu = 103.1$ ; Na molybdate, 843°,  $\kappa = 1.411$ ,  $\mu = 107.50$ ; 1408°,  $\kappa = 2.403$ ,  $\mu = 210.61$ ; Na tungstate, 879°,  $\kappa = 1.355$ ,  $\mu = 107.38$ ; 1501°,  $\kappa = 2.453$ ,  $\mu = 221.35$ . The mol. cond. is a linear function of temp. of the form  $\mu = A + B(t - t_0)$ .

R. E. HALL.

**Electrolytic dissociation.** S. ARRHENIUS. Stockholm. *Trans. Faraday Soc.* 1919 (advance copy), 8 pp.—A review and discussion of the important supporting evidence, most of which is generally known and repeatedly discussed.

WILBERT J. HUFF.

Some investigations bearing on the present position of the ionization theory. S. F. ACRHE. *Trans. Faraday Soc.* 1919, (advance copy), 9 pp.—A review of researches since 1905 by the author and others establishing the activities of mols. of electrolytes and nonelectrolytes as well as of simple and complex ions.

WILBERT J. HUFF.

Some aspects of the electrolytic dissociation theory. NIL RATAN DHAR. Imperial College of Science, London. *Trans. Faraday Soc.* 1919 (advance copy), 13 pp.—A discussion of some of the more recent work with special attention to the hypothesis of Snethlage (*C. A.* 9, 2340, 3011). "To enumerate the services rendered by the dissociation theory . . . is to review practically the whole of exptl. work in physical chemistry . . ." Snethlage's hypothesis cannot be of much service since it does not explain satisfactorily known facts not to speak of opening up new fields of investigation.

WILBERT J. HUFF.

The determination of the ionization of an aqueous solution. W. R. BOUSFIELD. *Trans. Faraday Soc.* 1919 (advance copy), 26 pp.—A mathematical and theoretical discussion dealing particularly with the coeff. of ionization in concd. solns. The expressions  $a^2/(1 - a) = k[(h - n)/\gamma_0]_P$  (based on cond. data) and  $\delta p/p = (1 + a)/\gamma(h - n)$  (from vapor-pressure measurements) are shown to cover not only the case of the alkali chlorides, but also the exceptional case of  $\text{KNO}_3$ , when  $h$  is the number of g.-mols. of HOH per g. mol. of the solute and  $n$  is the number of g.-mols. of HOH in

combination with 1 g.-mol. of the solute,  $P$  is a const. whose value is  $1/2$  for a strong electrolyte and unity for a weak one,  $k$  is the ionization const. and  $\gamma$  and  $\gamma_0$  are functions of the concns. which at great dilns. become equal to unity and which give good results when taken in the form  $\gamma = 1 + Bm$  and  $\gamma_0 = 1 + B_0m$ , where  $m$  is the concn. in g.-mols. per l., and  $B$  and  $B_0$  are the const. which express the effect of the water reactions upon the mol. constitution of the water. The above expressions appear to be of wide, general application when considered in connection with the law of mass action; the new factors  $\gamma$  and  $\gamma_0$  express numerically the increase in the activity of the water in producing vapor pressure and the decrease in its activity in producing ionization. Thus, the high vapor pressure of concd.  $\text{KNO}_3$  solns. may be due to the action between the  $\text{KNO}_3$  and the ice mols. to give steam mols. More research on the form of the functions  $\gamma$  and  $\gamma_0$  is necessary. Future considerations must embrace true mobilities and transport numbers by the estn. of ionic sizes and vols. in relation to mobilities. Autolytic ionization in very concd. solns. must also be investigated.

WILBERT J. HUFF.

**Electrolytic conductivity in non-aqueous solutions. III. Relations between the conductivity of the solute and several physical properties of the solvent.** HENRY JERMAIN MAUDE CREIGHTON. Swarthmore College. *J. Franklin Inst.* 187, 313-8 (1919).—Study was made of the cond. of trimethyl-*p*-tolylammonium iodide in 13 different org. solvents and in aq. soln. (cf. *C. A.* 13, 88). The relationship established by H. C. Jones (the cond. of comparable equiv. solns. of binary electrolytes in certain solvents are inversely proportional to the coeff. of viscosity of the solvent in question, and directly proportional to the association factor of the solvent) held in general for this solute and the solvents used. The Nernst-Thomson hypothesis that the solvent with the higher dielec. const. should cause the greater dissociation of the solute at a given diln. was found to hold only approx. in this study. The relations considered are probably complicated by association of the mols. of the solute to form polymerized mols.

JOSEPH S. HEPBURN.

**The correction of the transference numbers of the ions of an electrolyte.** W. R. BOUSFIELD. St. Swithin's, Hendon. *Trans. Faraday Soc.* 1919 (advance copy), 7 pp.—To correct for the fact that the ions of the electrolyte carry water, the expressions  $[U/(U + V)] = n_1 + \mu(1 - a)(n_1C - n_2A)$ ,  $[V/(U + V)] = n_2 - \mu(1 - a)(n_1C - n_2A)$ , are derived. Here  $U$  = velocity of cations relative to the trough, in cm./sec.,  $V$  = velocity of anions,  $n_1$  and  $n_2$  = the actual Hittorf numbers,  $\mu$  = the concn. of the solute in gram equivalents per cc. of soln.,  $a$  = the ionization coeff.,  $C$  = the vol. in cc. of one equiv. of cations,  $A$  = the vol. in cc. of one equiv. of anions. Values for  $C$  and  $A$  are calcd. by methods given in former papers. (Cf. *C. A.* 7, 1834; 8, 285, 2290, 3294.) A table of corrections for  $\text{LiCl}$  (an extreme case) is calcd., showing that the corrections are less than the experimental errors down to normal concn.

W. J. H.

**Note on the hydration of ions.** HENRY J. S. SAND. Sir John Cass Technical Institute. *Trans. Faraday Soc.* 1919 (advance copy), 4 pp.—A criticism of the calcns. of Bousfield and Lowry (*Trans. Faraday Soc.* 3, 123 (1907)) for the detn. of the magnitude of a hydrated ion, in which are pointed out inconsistencies in assumptions by B. in calcns. comparing the size of the K ion and the HOH mol. Correcting these, S. concludes that the two magnitudes would be nearly equal. He believes, however, that the application of Stokes' formula to mol. magnitudes is inadmissible and illustrates by extending the calcns. to the size of the OH ion, which gives a value about 30 times smaller than is given by the calcn.  $(17/N) \times \text{true sp. vol. hydroxyl ion}$ .

W. J. H.

**Some recent investigations on the dilution law.** J. R. PARTINGTON. *Trans. Faraday Soc.* 1919 (advance copy), 24 pp.—A survey, though not complete, of the

literature subsequent to the paper abstracted in *C. A.* 4, 2402, with calcns. connecting developed relations and differences.

WILBERT J. HUFF.

**Complex ions.** I. M. KOLTHOFF. Utrecht. *Chem. Weekblad* 15, 1636-44(1918).—Exception is taken to the definition of complex ions proposed by de Haas (*C. A.* 13, 277), since it is too limited. For pedagogical purposes, it is better than K.'s definition (*C. A.* 12, 2480), but for scientific accuracy, the latter is preferable. K. takes occasion to reword his definition, to read as follows: Complex ions dissociate to a certain extent into simple ions, with possible formation of neutral mols. JULIAN F. SMITH.

**Properties of the colloid state and their application to industry.** W. C. McLEWIS. *J. Soc. Chem. Ind.* 38, 1-47(1919).—A brief review is given of some of the fundamental conceptions in the chemistry of colloids. There are few broad comprehensive principles. Colloid chemistry is primarily that of surface layers and capillary chemistry is not yet well developed. The work of Langmuir (*C. A.* 12, 2152) and that of Harkins (*C. A.* 11, 731, 1588) are real advances in this field. The accepted elec. theory of colloids is not entirely satisfactory. For instance, the work of Powis (*C. A.* 10, 300, 2825) indicates that the point of coagulation and point of elec. neutrality are not identical. The elec. cond. of metal colloids is greater than that calcd. from the charge on the particles. It is also 8 times greater for Pt than for Au sols. (cf. Beans and Rastlack, *C. A.* 10, 7). The Hardy-Schultze ppt. law does not always obtain because specific adsorption is also a factor. Electrically charged particles having the same sign should repel one another, but certain colloids protect others having the same sign. Colloid chemistry is badly in need of quant. work. The science is not sufficiently advanced to meet the needs of technical and biological chemistry. E. B. SPEAR.

**The colors of colloids.** II. WILDER D. BANCROFT. Cornell Univ. *J. Phys. Chem.* 23, 1-35(1919); cf. *C. A.* 13, 680.—With the aid of quotations the author reviews the laws of reflection and refraction applicable to the effect of light rays on thin films and colloidal particles. The relation of absorption to reflected and transmitted light, normal and anomalous dispersion and the effect of these on color are dealt with. Partial and total reflection and plane, circular and elliptical polarization are discussed. As a consequence of different wave length color may result from selective absorption, selective reflection, or selective refraction. E. B. SPEAR.

**Investigations on the absorption of water by gelatin.** EDITH B. SHREVE. Desert Lab., Tucson, Ariz. *J. Franklin Inst.* 187, 319-37(1919); cf. *C. A.* 13, 4.—When H<sub>2</sub>O was absorbed by gelatin, the ratio of the increase in wt. of the jelly to its increase in vol. was a const. Although the reaction is exothermic, heat favored the imbibition of water by gelatin within the temp. range 10° to 35°; the reaction attained merely an apparent, not a true equil., hence did not run contrary to Le Chatelier's theorem. When a jelly was prepd. from dry gelatin and any 1 of the following sols., or when a jelly containing 72% H<sub>2</sub>O was allowed to absorb completely 0.2 to 0.3 its own vol. of any 1 of these sols. at 10° to 35°, the subsequent rate of uptake of H<sub>2</sub>O was increased: *M* (molar) NH<sub>4</sub>Cl, *M* NaCl, *M* NaBr, 2 *M* and *M* alc., 2 *M* and *M* Na citrate, 2 *M* and *M* Na tartrate, and *M* and 0.5 *M* Na<sub>2</sub>SO<sub>4</sub>. When a jelly was prepd. from dry gelatin and H<sub>2</sub>O, then placed in any 1 of the above sols., the rate of imbibition of H<sub>2</sub>O was greater for NH<sub>4</sub>Cl, NaCl, and NaBr than for distd. H<sub>2</sub>O, and was less for alc., Na citrate, Na tartrate, and Na<sub>2</sub>SO<sub>4</sub> than for distd. H<sub>2</sub>O. "It is, then, not safe to draw conclusions regarding the effect which substances within a jelly exert upon its imbibitional capacity, when the evidence for such a conclusion lies in the known effect of an external soln. of the same substance on that same or other jellies." JOSEPH S. HEPBURN.

**The degree of dispersion of colloids and its determination.** GEORGE KING. *J. Soc. Chem. Ind.* 38, 4-77(1919).—A detailed description is given of the principles and

methods employed in the use of Zsigmondy's slit and cardioid ultramicroscope. K. was associated with Zsigmondy in the latest development of this instrument, the immersion ultramicroscope. In order that a greater magnification and a more intense illumination can be employed a portion of the microscope objective and a corresponding portion of the condenser are cut away. As a result, both the objective and the condenser, which are at right angles to each other, are immersed in the soln. An ebony cup has been substituted for the glass cuvette formerly used. Thus diffused illumination from the sides of the vessel is avoided. The smallest particles that can be counted with the old instrument have a diam. of  $5\mu$ . Particles of  $3\mu$  diam. can be counted with the immersion ultramicroscope, while even smaller particles can be seen in concd. soln. Work with the new instrument shows that previous estimates as to the number of particles in a given soln. are too low because the smaller particles could not be counted with the slit ultramicroscope. The smaller particles cannot be accurately detd. in concd. soln. owing to the diffusion of light by the larger ones. For this reason dil. solns. appear to contain relatively more particles than the more concd. In a particular case where a soln. was dild. 5 times,  $\frac{1}{5}$ , instead of  $\frac{1}{4}$ , as many particles were counted.

E. B. SPEAR.

**Retardation by sugars of diffusion of acids in gels.** JOHN ARTHUR WILSON. *J. Am. Chem. Soc.* 41, 358(1919).—A reply to the statement by E. A. and H. T. Graham (*C. A.* 13, 134) that the power of sugar to decrease the swelling of acid swollen gelatin cannot be accounted for by Procter's ion concn. theory (*C. A.* 10, 1807). P. dealt only with systems such that he could safely ignore the effects of thermodynamic environment, but if the differences in molal fugacity of sugar due to the differences in ionic concns. in the 2 phases are taken into account, P.'s theory does offer a plausible explanation of the action of sugar in repressing the swelling of gelatin.

J. A. W.

**A problem in lubrication.** W. B. HARDY. *J. Soc. Chem. Ind.* 38, 7T(1919).—Newly scraped surfaces of both solids and liquids have very different properties from those satd. with air. Raw surfaces of glass when brought together with slight pressure seize, so that considerable force is necessary to cause them to slip. Water, ether, alc. benzene and strong ammonia fail to prevent seizing. A thin film (depth about  $1 + 10^{-7}$ ) of glycerol is not so good a preventative as an excess. On the contrary thin films of acids appear to be better than flooding the surface. True lubricants stand in between these two extremes, thin films being quite as good as an excess. From these facts the author concludes that lubricants are adsorbed on the surface, and that the chem. constitution of the lubricant is the deciding factor. Lubrication becomes, therefore, a special problem in colloidal physics.

E. B. SPEAR.

**The adsorption of metals from drinking water by glass.** K. SCHERINGA. *Pharm. Weekblad* 56, 8-9(1919).—The apparent adsorption of heavy metals from  $H_2O$  soln. by glass is really only apparent. If the glass container is carefully cleaned with soap, rinsed several times with boiling  $H_2O$ , and filled while wet it will not adsorb aniline dyes from boiling aq. soln. Flasks similarly treated were filled with solns. of  $Pb(OAc)_2$  (10 mg. per l.),  $CuSO_4$  (5 mg. per l.) and  $ZnSO_4$  (10 mg. per l.), resp. No decrease in metal content could be detected after 2 days; the loss after 4 days was barely perceptible colorimetrically. Losses previously observed (*C. A.* 5, 2288) are now ascribed to pptn. by chem. reactions or to settling of fine suspensions. A little  $HOAc$  should be added to fresh samples, to prevent pptn. of  $PbCO_3$  by absorption of  $CO_2$  before analysis. The expts. of Bancelin (*C. A.* 8, 1898) on adsorption by glass are not conclusive, since the glass was not previously washed and heated.

JULIAN F. SMITH.

**Structure of crystals in extremely thin plates: a new experimental determination of the molecular magnitude.** RENÉ MARCELIN. *Ann. phys.* 10, 189-94(1918).—The



method consists in examg. plates of crystals so thin as to show Newton's ring colors by reflected light, as in a metallographic microscope, and detg. the thickness by comparison with a quartz wedge viewed between crossed nicols, using a Michel-Levy comparator. Sheets of mica of sufficient thinness were made by pressing a piece against a bit of melted Se, allowing to cool, and pulling apart. The differences in thickness between different parts of a given sheet of the mica were found to be multiples of  $0.70\mu$ , which agrees closely with the theoretical diameter of a mica mol. *p*-Toluidine crystals of similar thinness were obtained by evapg. a soln. in EtOH. In this case the differences in thickness measured were between  $0.3$  and  $0.7\mu$ , while the theory is about  $0.50\mu$ . Adjoining layers thus differ in thickness by no more than 2, and probably only single, mols.

E. T. WHERRY.

**The orientation of anisotropic liquids in contact with crystals.** II. F. GRANDJEAN. *Bull. soc. franc. min.* 40, 69-105 (1917).—Continuation of C. A. 11, 750, 1939.—About 100 instances of orientation have now been studied, and the phenomenon proves to be a general one. The relations fall into 3 types: (1) there are one or more orientations which are independent of the temp.; (2) the orientation is fairly definite, but changes sharply with the temp.; and (3) the orientation varies continuously with the temp. The 5 new liquids studied are: *p*-azoxyanisolephenetole, dibenzylidenebenzidine, di-*p*-toluylidenebenzidine, *m*-hydroxycinnamic acid, and anisal-*p*-aminoazotoluene. These were studied on cleavage surfaces of the minerals: orpiment, sphalerite, phlogopite, brucite, talc, pyrophyllite, muscovite, halite, sylvite, and leadhillite. For the detailed results the original should be consulted. Definite forces are found to exist, acting between the mols. at the surface of the crystal and those of the liquid.

E. T. WHERRY.

**The resistance of an electrolytic cell.** EDGAR NEWBERRY. Manchester Univ. *Trans. Faraday Soc.* 1919 (advance copy), 11 pp.—The total opposition to the passage of the current through a cell is the sum of the back e. m. f. and the resistance proper. The resistance proper is made up of two parts—that due to the electrolyte and the transfer resistance from the electrode to the electrolyte. N. studied this transfer resistance in a number of cells and shows it to be the greatest where gases are liberated, considerable where gaseous ions carry the current, and small when the current is carried by metallic cations and anions which dissolve the anode. High transfer resistances are favored by low current density, low temp., polished surfaces and high overvoltages. They are due to mechanical resistances opposing the penetration of gaseous ions. N. fears that much of the present data on cond. are inaccurate because transfer resistances were not perfectly eliminated and judges it unsafe to build any elaborate theory of electrolytic dissociation on the older data.

WILBERT J. HUFF.

**Chemical warfare—a new weapon.** E. HENDRICK. *Chem. Met. Eng.* 20, 152-4 (1919).—Report of an interview with Brigadier General Amos A. Fries, U. S. A. Novel views are expressed on the future of gas warfare based on the latest developments. There was a lower death rate (5%) from gas casualties than from all others.

F. W. SMITHER.

**Some problems of gas warfare.** ELLWOOD B. SPEAR. Mass. Inst. Tech. *Sci. Monthly* 8, 275-83 (1919).—The article deals with the development of offensive and defensive gas warfare. The object of the use of gas and the means taken to defeat it are pointed out. Cuts of a German gas cylinder and of German gas shells are given, while several photographs of German, French, British and American gas masks are reproduced. The advantages and defects of the various types of gas masks are discussed. The attention is also directed to some of the specific difficulties encountered in the development of the defense. A partial list is included of the gases employed in cloud attacks, gas shells and hand grenades.

E. B. SPEAR.

**The absorbent power of dry or moist earth toward chlorine gas.** DANIEL BERTHELOT AND RENÉ TRANNOY. *Compt. rend.* 168, 121-3 (1919).—Expts. were made to ascertain to what extent earth might serve as a means of protection against clouds of Cl gas. A white sand and a yellow ferruginous sand proved inferior absorbents and moisture scarcely increased their absorbent power. Humus-containing soils showed themselves much better absorbents and the absorbent power was of the same order for the different samples used. It apparently did not depend on the CaO content of the soils. The absorbent power was increased 2 to 2.5 fold by a 10% moisture content. The additional Cl absorbed when the moisture was increased to 20% was due to the Cl dissolved in the additional 10% of H<sub>2</sub>O.

ALBERT R. MERZ.

Amphoteric colloids (LOEB) 11A. Color of water (BANCROFT) 14. Magnetochemistry. Applications to analytical chemistry (QUARTAROLI) 7.

ANDERSON, WILLIAM BALLANTYNE: *Physics for Technical Students. Sound, Light, Electricity and Magnetism.* New York: McGraw-Hill Book Co. 458 pp. For review see *Am. J. Sci.* 47, 229 (1919).

COPAUX, H.: *Introduction à la chimie générale.* Paris: Gauthier-Villars et Cie. 212 pp. 6 francs.

FENNER, GOTTFRIED: *Kaufmännisch-chemisches Rechnen. Leichtfaszliche Anleitung zur Erlernung der chemisch-industriellen Berechnungen für Kaufleute, Ingenieure, Techniker, Chemotechniker, usw.* Leipzig: Otto Spamer. geh. M. 3.50, geb. M. 4.50 und 20% Teuerungs-zuschlag. For review see *Chem. Weekblad* 16, 89 (1919).

FERRY, ERVIN S., *et al.*: *A Handbook of Physics Measurements. Vol. I. Fundamental Measurements, Properties of Matter and Optics. Vol. II. Vibratory Motion, Sound, Heat, Electricity and Magnetism.* New York: John Wiley & Sons, Inc., London: Chapman & Hall, Ltd. 251 + 233 pp. \$2 a volume. For review see *Bull. Am. Inst. Mining Eng.* No. 147, lxxxiii (1919) or *J. Am. Soc. Mech. Eng.* 41, 308 (1919).

GRASSET, JOSEPH: *La science et la philosophie.* Paris: La Renaissance du livre. 196 pp. F 2.50.

HAUSBRAND, E.: *Verdampfen, Condensieren und Kühlen.* 6th Ed. Berlin: Julius Springer. 540 pp. For review see *Chem. Weekblad* 16, 85 (1919); cf. *C. A.* 11, 2977.

KOLBENHEYER, ROMAN VON E. G.: *Die Kindheit des Paracelsus.* 5th Ed. München: Georg Müller Verlag. 376 pp. For review see *Chem. Weekblad* 15, 1665 (1918).

LIVENS, G. H.: *The Theory of Electricity.* Cambridge, England: The University Press. 717 pp. \$8.25. For review see *Bull. Am. Inst. Mining Eng.* No. 147, lxxxiii (1919).

RIGHI, A.: *I fenomeni elettro-atomici sotto l'azione del magnetisma.* Bologna: Nicola Zanichelli. 436 pp. L. 17.50.

STEWART, ALFRED W.: *Recent Advances in Physical and Inorganic Chemistry. Introduction by Sir William Ramsay.* 3rd Ed. New York: London, Bombay, Calcutta and Madras: Longmans, Green & Co. 284 pp. 12s. 6d. net. Cf. *C. A.* 6, 2206.

SLATE, FREDERICK: *The Fundamental Equations of Dynamics and its Main Coördinate Systems Vectorially Treated and Illustrated from Rigid Dynamics.* Berke-

ley, Calif.: Univ. of Calif. Press. 233 pp. \$2. For review see *Bull. Am. Inst. Mining Eng.* No. 147, lxxxiii(1919) or *J. Am. Soc. Mech. Eng.* 41, 308(1919).

STRONG, W. W.: *The New Science of the Fundamental Physics*. Mechanicsburg, Pa.: S. I. E. M. Co. 107 pp. \$1.25. For review see *J. Frank. Inst.* 187, 374 (1919).

WIGMORE, JOHN H.: *Science and Learning in France, with a Survey of Opportunities for American Students in French Universities: an Appreciation by American Scholars*. Chicago: A. C. McClurg & Co. 454 pp. \$1.50 cloth, \$1.00 paper. For review see *Astrophys. J.* 49, 63(1919).

### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

**Radioactivity of Italian minerals.** L. FRANCESCONI, N. GRANATA, A. NIEDDU AND G. ANGELINO. Univ. Genoa. *Gazz. chim. ital.* 48, I, 112-3(1918).—In continuing some earlier observations (*C. A.* 9, 175) many other Italian and foreign specimens have been examd. for radioactivity with a Schmidt electrometer. Minerals of Pb examd. were galena, anglesite, cerussite, phosgenite, leadhillite, pyromorphite and wulfenite; of Zn blende and calamine, of Fe pyrite and hematite, of Sb stibnite, of Sb-Fe-Ni berthierite, ullmannite, of Cu chrysocolla, malachite, azurite, chalcocite, of V vanadinite, of Cu and Fe chalcopyrite as well as molybdenite, barite, scheelite and variscite. Of these pyromorphite (varying in intensity according to physical properties, especially color), wulfenite and chrysocolla were radioactive. In the latter the radioactive material was pptd. in the  $\text{NH}_4\text{OH}$ ,  $\text{NH}_4\text{Cl}$  group. Radioactive W (from Traversella), Mn and Pb minerals were found. A malachite from Chile was intensely radioactive. Galena from Argentina was radioactive.

E. J. WITZEMANN.

**The mechanical and electrodynamical properties of the electron.** MEGH NAD SAHA. Univ. Coll. Science, Calcutta. *Phys. Rev.* 13, 35-44(1919).—The present paper is an extension of Minkowski's method of four-dimensional analysis to the investigation of the mechanical and electrodynamical problems connected with the electron. It cannot be given in a short abstract. The following subjects are taken up in turn and discussed: (1) The scalar and vector potentials of a moving electron; (2) the electric and magnetic fields due to a moving electron; (3) Maxwell's stresses, Poynting-Vector, etc., (4) the law of attraction between two moving electrons; (5) equations of motion of the electron.

F. P. PHELPS.

**Ionization and resonance potentials for electrons in vapors of arsenic, rubidium and cesium.** PAUL D. FOOTE, O. ROGNLEY AND F. L. MOHLER. Bur. Standards. *Phys. Rev.* [2] 13, 59-70(1919).—Two types of inelastic collision between the electron and atom occur in vapors of As, Rb and Cs. The p. ds. through which an electron must fall to attain sufficient energy or velocity to produce these collisions are known as the resonance and ionization potentials for the particular metal in question. For Rb and Cs the resonance potential is detd. by the quantum relation  $h\nu = eV$ , where  $\nu$  denotes the frequency corresponding to the first doublet of the principal series. A similar relation holds for the ionization potential where  $\nu$  denotes the convergence frequency of the principal series. Exptlly. detd. values of the resonance and ionization potentials for Rb were 1.6 v. and 4.1 v., resp.; for Cs, 1.48 v. and 3.9 v., resp.; for As, 4.7 v. and 11.5 v., resp. By applying the quantum relation to the results obtained with As it is possible to predict the presence of an undiscovered spectral series in As having its first term (or terms if a doublet series) near  $\lambda = 2620 \text{ \AA.}$  and converging near

$\lambda = 1070 \text{ \AA}$ . A Wehnelt tube discharge in As possesses no luminosity, indicating that the important series lines lie in the ultraviolet. At the ionization potential of Rb and Cs the principal, first, and second subordinate series appear. No ionization whatever could be detected at the resonance potentials of Rb, Cs, and As.

F. P. PHELPS.

**Ionization and excitation of radiation by electron impact in nitrogen.** BERGEN DAVIS AND F. S. GOUCHER. Phoenix Lab. *Phys. Rev.* 13, 1-5(1919).—This paper presents results obtained in further expts. on ionization and excitation of radiation by electron impacts in gases (cf. C. A. 11, 3173). It is shown that radiation can be stimulated in N mols. by electron bombardment without any appreciable ionization of the same. The value 7.5 volts heretofore accepted as the value of the ionizing potential really corresponds to the least energy an electron must have in order that it may excite radiation by the bombarded mol. There is an indication of a more intense type of radiation setting in at about 9 v. Ionization sets in at about 18 v.

F. P. PHELPS.

**Energy of the characteristic X-ray emission from molybdenum and palladium as a function of the applied voltage.** BENJAMIN ALLEN WOOTEN. Phoenix Lab., Columbia Univ. *Phys. Rev.* 13, 71-86(1919).—The relations between the energy of the lines of the K series characteristic X-radiation of Mo and Pd and the voltage between them have been studied. It was found that in each metal the  $\alpha$  and  $\beta$  radiation appeared at a certain voltage, 19.2 kv. for Mo and 24 kv. for Pd. For Mo this measured critical voltage is almost exactly that required by the Planck hypothesis to produce the  $\beta$  line, while for Pd it is that required by the same hypothesis to produce a wave length slightly shorter than the  $\beta$  line. Curves of the voltage squared *vs.* the intensities of the  $\alpha$  and  $\beta$  radiations for both metals show that these intensities vary directly as the square of the voltage for potentials not too near the critical voltage. The ratio of the intensity of the  $\alpha$  line to that of the  $\beta$  line becomes const. as the voltage is increased. The straight line parts of the curves, if produced, back cut the voltage-squared axis in the same point, and this point was found to bear the same relation to the atomic number of the metal of the anti-cathode that the point at which the curves themselves cut the axis bears, that is, the square root of the coördinate represents a voltage proportional to the square of the atomic number of the radiator. Absorption coeffs. for wave lengths of the  $\alpha$  and  $\beta$  lines of Mo and Pd in glass and in Mo and Pd, respectively, were found to vary approx. as the cube of the wave length of the radiation. The observed intensities of the  $\alpha$  and  $\beta$  lines of each metal were corrected for absorption in the glass of the X-ray tube. By application of the theory of Bergen Davis it was possible to calc. the ratio of the intensity of the  $\alpha$  radiation to that of the  $\beta$  radiation as given by a single atom. The curves obtained by plotting the theoretical equation were found to agree excellently with the exptl. curves.

F. P. PHELPS.

**Absorption spectra of X-rays.** J. W. NICHOLSON. *J. Röntgen Soc.* 14, 18-24 (1918).—A semi-popular lecture covering a part of de Broglie's work, some of which has been published in *J. Physique*.

F. P. PHELPS.

The heat capacity of electro-positive metals and the thermal energy of free electrons (LEWIS, *et al.*) 2.

HENRICH, F.: *Chemie und chemische Technologie radioaktiver Stoffe*. Berlin: Julius Springer. 351 pp. M. 12. For review see *Chem. Weekblad* 16, 55(1919).

KUMMELL, G.: *Photochemie*. 2nd revized Ed. Leipzig, Berlin: B. G. Teubner. 107 pp. M. 1.50. For review see *Chem. Weekblad* 16, 129(1919); cf. C. A. 3, 30.

## 4. ELECTROCHEMISTRY.

COLIN G. FINK.

**Nature's gift to the electrochemist at Muscle Shoals.** W. G. WALDO. *Trans. Am. Electrochem. Soc.* 33, preprint; *Met. Chem. Eng.* 18, 444-6(1918).—W. outlines the complete project of development at Muscle Shoals and emphasizes the economy in its construction and the estimated low cost of power ( $1\frac{1}{2}$  mills per kw-hr.). Besides the advent of cheap power, abundance of both raw materials and labor and a mild climate offer great advantages to electrochem. industries. W. H. BOYNTON.

**Coal consumption in generating stations.** ANON. *Electrician* 82, 218-9(1919).—Data from industrial establishments in Canada and the U. S. based on a report of the Ontario Hydro-Electric Power Commission. For plants over 100,000 kw. capacity, averages  $6\frac{1}{4}$  tons per h. p. yr.; for 1000 to 5000 kw., 14 tons. C. G. F.

**Electric furnace improvements during 1918.** A. V. FARR. *Iron Trade Rev.* 64, 211-5(1919); *Blast Furn. Steel Plant* 7, 20-4(1919).—A review. C. G. F.

**Electric furnaces in the steel industry and their relation to the central station business.** ANON. *Chem. Met. Eng.* 20, 73-6(1919).—About 300 elec. steel furnaces are now operating in America. Single phase and low power factor furnaces are no longer used but furnaces taking off-peak power for steel melting and founding are popular. The article deals mainly with engineering and economic phases of steel melting. O. C. R.

**Water-jacketed electric blast furnace.** AMÉDÉE SÉBILLOT. *J. four. élect.* 27, 215(1918).—Previous installations for the elec. production of pig Fe have called for great masses of costly brickwork which rapidly disintegrated under the high temp. of the elec. arc. The author's furnace avoids all masonry near the arc. The furnace consists of a rectangular tower completely water-jacketed, similar to the water-jacketed rectangular Cu smelting furnaces used at Anaconda. At top of tower are placed the charging door, water outlet and exhaust for the hot gases. Crucible to catch melt is placed at base of tower near which is inlet for the cold jacket water. Producer gas is admitted just above the crucible and passes up between electrodes placed horizontally on each side of the tower. The charge of ore and flux (no coke) works downward between the electrodes, meeting an upward current of hot reducing gases. Used gases are exhausted by a blower placed at the top of the furnace. The length of tower can be extended at will to increase production. An estimated production of 20 tons per meter of length per day is given for such a furnace 25 meters long. Actual construction of above furnace has not yet been made. C. H. ELDRIDGE.

**Eliminating phosphorous and sulfur in electric ferromanganese furnaces.** J. LONERGAN. *Chem. Met. Eng.* 20, 245(1919).—Tabulated results are given from test run (by Iron Mountain Alloy Co., Denver, Colo.) to det. the proportions of both P and S which can be eliminated by ordinary practice. Results show that at least 98% of S is eliminated and that 52.6% of P is retained by the metal, while 31.4% of P is carried off mechanically. Based upon results found, it required 2830 lbs. dry ore to make 1000 lbs. ferro-Mn. On the basis that 52.6% of the total P charged will go with the metal, no more than  $4\frac{3}{4}$  lbs. P can be carried in 2830 lbs. ore and in about 1760 lbs. coal and limestone. Assuming coal and limestone to carry 0.34 lb. P, the ore must carry 0.17% P to produce ferro-Mn, with 0.25% P, which is the max. allowable. C. H. ELDRIDGE.

**Baily electric brass-melting furnaces.** ANON. *Elec. Rev.* 74, 438(1919).—The elec. furnace method of melting brass has made advance in the last 2 yrs., partly because of the high cost of the crucibles which are rapidly used up in the ordinary methods

of melting this alloy, and partly also because this old method has resulted in high Zn losses. The new Bailly brass furnaces are of the tilting type, 105 kw., 1500 lbs. brass, at 600 lbs. per hr.

C. G. F.

**Electrodes of carbon.** J. A. HOLDEN. *Iron Age* 102, 1485(1918).—H. points out the respective advantages of graphite and amorphous C for electrodes. The low elec. cond. of the amorphous C makes the large electrodes act as powerful insulators to the furnace roof, increasing the life of the roof materially. A jointing paste of good conducting material, such as a mixt. of finely pulverized Ceylon graphite and hot anhydrous tar of the consistency of treacle, is required. This paste is heated to 90° and smeared over the lower half of the plug, which is then screwed home. Storage of electrodes over an annealing or drying stove will help to avoid cracking, due to dampness. Electrodes burning very thin and tapering to a point are said to "point" badly. This fault causes breakage with attendant loss of time for replacements.

W. H. BOYNTON.

**The mercury process for the electrolytic production of caustic alkali and chlorine.** GINGORO YAMAZAKI. *J. Chem. Ind. (Japan)* 21, 1097(1918).—Y. introduced a new device which has advantages over the older Hg processes in respect to the amt. of Hg, current efficiency and concn. of the alkali soln. Two pairs of electrolytic chambers compose a unit (see fig.); *I, I<sub>1</sub>* anode chambers, *II, II<sub>1</sub>* cathode chambers of cement.

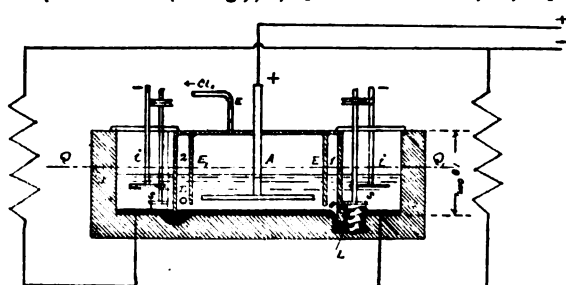


Fig. 1.

Sectional Elevation P—P<sub>1</sub>.

provided with perforations; *R*, outlet for the soln.; *O* and *O<sub>1</sub>*, slightly raised ends of partitions. To the cover are attached anode *A* of Atcheson graphite, Cl pipe *E*, etc. The cathodes were Fe. In each cathode chamber there is a special vertical cylinder, in which an Archimedes screw rotates. The cylinder has two apertures in the wall, one near the top and the other near the bottom, one leading to the cathodic and the other to the anodic chamber, respectively. *D* is a small compartment for solid NaCl, through which electrolyte under electrolysis flows from *I<sub>1</sub>* to *I*, or *vice versa*, in order to keep the soln. satd. A number of expts. was completed and Y. came to the conclusion that (1) the percentage of H gas in the anodic chamber gas was below permissible limit when the electrolysis temp. was raised to 40–60°. (2) The decompn. velocity of the amalgam increases with the temp. The amalgamated Na is transferred from *I, I<sub>1</sub>* to *2<sub>1</sub>, 2* and

Hg communicates with all 4 cells through paths *H, H<sub>1</sub>*; hence, the Hg in all chambers is on the same level. The electrolytes are kept sepd. by the Hg seal. *E, E<sub>1</sub>, E<sub>1</sub>'* are two subwalls in the anodic chambers, having horizontal slits at the bottom; they form small cells, 1, 2, 3, 4, between partitions and subwalls. *T, T<sub>1</sub>* = a pair of inlet pipes for electrolyte

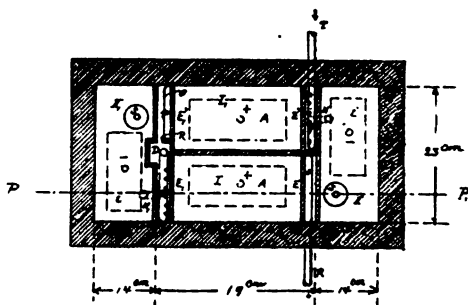


Fig. 2.

Sectional Plan Q—Q<sub>1</sub>.

mobile Hg from which Na is removed is allowed to run from 2,2, down to 1,1. The Na content of the amalgam may be changed by changing the velocity of the suction pump. The electrolyte is introduced from outside tank through pipes T,T, through the perforations, the direction being the same as that of the flow of the Hg. The dild. salt soln. after being electrolyzed in 1 becomes satd. by passing through D, and flows into 1, is again electrolyzed and flows out through R. The subwalls in the anode chambers prevent the fresh electrolyte from mixing with the old one having Cl gas dissolved in it. As the electrolyte which comes into contact with Hg surface is concd., salt soln. containing very little free Cl, no Na in the amalgam is lost by combination with Cl. (3) When Na content of the amalgam was increased from 0.060 up to 0.203% no remarkable increase of anodic H gas was observed; it was always below 0.5%. These results prove a uniform circulation of Hg through the chambers by the new process. The electrode potential decreased with the rise of temp. and increased with the increasing Na content of amalgam. The increase of alkali content in cathodic chambers from 28 to 40% and the change of current density had a marked influence on the anodic gas composition; the current efficiency remained nearly the same, from 89 to 95%. Impure material containing a small amt. of Ca and Mg salts gave a slight increase in the amt. of anodic H, yet still below 1%, and no other striking changes were observed compared with the cases when pure salt was used. Ten kg. of Hg was used for 100 amp., with current density of 20.8 to 25.0 amp./sq. dm. There was no marked changes in current efficiency and the compn. of the anodic gas during continuous running for over 30 days and the chem. and mechanical losses of Hg were very slight.

T. YOSHIOKA.

**The future of electrolytic chlorine.** A. H. HOOKER. *Trans. Am. Electrochem. Soc.* 34 (advance copy).—The Cl industry of the U. S. has developed entirely along electrolytic lines and new uses should be found for Cl, against which the Cl can be charged at a fair operating price. Synthetic indigo, sulfur colors, picric acid, benzoic acid, etc., all point to an increasing consumption of Cl, also the use of  $AlCl_3$  for cracking petroleum oils, and the use of Cl in the treatment of ores. Also in *Chem. Eng.* 27, 3-4(1919). W. H. BOYNTON.

**Manufacture of hydrochloric acid from the hydrogen and chlorine by-products of electrolysis of metallic chlorides.** ANON. *J. four Elect.* 27, 198(1918).—In the electrolysis of alkali chlorides to produce KOH and NaOH, both H and Cl are obtained as by-products. A method is outlined by which these gases can be safely united to produce a very pure HCl. The gases are forced under pressure through porous diaphragms. An excess of H is mixed with the Cl and the mixt. is exploded by being brought into contact with incandescent C or Pt. The resulting HCl is dissolved in water and the excess H is used over again. The excess of H reduces the violence of the explosion and holds down the heat. Compression of the gases facilitates diffusion through the porous diaphragm (which ensures an intimate mixt.), increases the reaction velocity, and thus allows the use of small units. Although the heat of reaction is enough to make the process continuous, the incandescent body is always used to insure against interruption. Small and simple explosion units are used. This avoids danger of a general explosion and offers ease of repairs and replacement. Danger of back-fire is lessened by the use of small units, excess H, compression of gases, and the mixing of the gases through porous diaphragms immediately before exploding. Estimates are given of cost of installation. C. H. ELDRIDGE.

**Laboratory electrodeposition plant.** C. R. HAYWARD. *Chem. Met. Eng.* 20, 240(1919).—Description (including photograph and sectional views) of an exptl. electrodeposition plant used for instruction at the Mass. Inst. of Tech. The plant consists of 5 vats 15" long  $\times$  7" wide  $\times$  12" deep, arranged in cascade. Sides and bottom are

of slate, ends of glass to allow inspection. Each vat contains 4 anodes and 5 cathodes spaced  $1\frac{1}{2}$ " apart and arranged in multiple. The submerged area of each electrode is 6 in. square, c. d. is 10-15 amp. sq. ft. of cathode, and voltage between electrodes is 0.2-0.4 volt. A Pohle air lift provides circulation. C. H. ELDRIDGE.

**A process for electrolytically refining nickel.** G. A. GUESS. *Trans. Am. Electrochem. Soc.* 35, preprint.—An electrolytic refining of nickel containing Cu and Fe produces a Ni deposit containing but 0.001% Cu. Fe goes into soln. and accumulates, while Cu dissolves and is pptd. continuously due to a suspension of  $\text{CaCO}_3$  in the electrolyte. The salt formed from the Cu in soln.,  $2\text{CuO} \cdot 2\text{NiO} \cdot \text{SO}_3$ , settles with  $\text{CaSO}_4$  as a mud. The cathode is enclosed in a canvas bag to insure freedom from mechanical impurities. It is necessary to treat the converter mat with dil.  $\text{H}_2\text{SO}_4$  or by fusion with coke and  $\text{Na}_2\text{SO}_4$ . Three sheet-Pb or sheet-Al cathodes  $15 \times 15$  cm. are suspended in canvas bags in each tank. The electrolyte consists of  $\text{NiSO}_4$  soln. containing 5.5-6.5% Ni; it is maintained at 40-50°. A small amt. of glue is used in the electrolyte. A c. d. of 143 amp. per sq. m. of cathode gives excellent Ni with a potential of 2 v. The amp. efficiency at the cathode is 98% and at the anode around 100%. The accumulated mud is removed regularly and shows after washing and drying: Ni, 8.28%; Cu, 9.10%; S, 8.88%;  $\text{CaO}$ , 30.1%; Fe, 1.4%. The mud is reduced by fusion to a Ni-Cu mat which is dead-roasted, reduced, cast into anodes, and used in Cu refining baths for recovery of Ni as sulfate. W. H. BOYNTON.

**Military applications of electroplating.** W. BLUM. *Metal Ind.* 16, 498-9(1918).—A classification of protective coatings on metal parts of military supplies. For protection of iron and steel against corrosion, only Zn coatings should be employed. Sand-blasting is preferable to pickling in the prepn. of iron or steel for plating. The principal applications for plating upon military supplies are Zn, black Ni, and Pb. Zn deposits may be obtained from sulfate or cyanide solns., Pb from fluosilicate and fluoborate solns., and black Ni from one or two types of soln. One consists of Ni and Zn sulfates and  $\text{NaSCN}$ , and the other of Ni and Zn sulfates with addition of  $\text{NaCN}$ ,  $\text{As}_2\text{O}_3$ ,  $\text{NaOH}$ ,  $(\text{NH}_4)_2\text{CO}_3$  and possibly other constituents. W. H. BOYNTON.

ROSMAN, L. A. S.: *Nederlandsche electrotechnische kalender voor het jaar 1919*. 5th Ed. Amsterdam: van Mantgem & de Does. 596 pp. f. 1.90. For review see *Chem. Weekblad* 16, 130(1919).

SARTORI, GIUSEPPE: *La technique pratique des courants alternatifs*. 4th French Ed. Translated from the Italian by J. A. Montpellier. Vol. I. *Exposé élémentaire et pratique des phénomènes du courant alternatif à l'usage des électriciens, contremaîtres et monteurs*. Paris: H. Dunod et E. Pinat. 576 pp. F. 22.50. For review see *Rev. sci.* 57, 95(1919).

The resistance of an electrolytic cell (NEWBERRY) 2. Magnetizable alloy (U. S. pat. 1,291,408) 9.

**Storage battery electrodes.** E. J. RUEB. U. S. 1,291,167, Jan. 14. Electrode supports for storage batteries are provided with active material in paste form, with the active material is mixed with the constituents of the electrolyte to be used in the completed battery, e. g., Pb oxide, glycerol,  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{H}_2\text{SO}_4$ , the electrodes are baked in an atm. of vapors from the electrolyte, cured by repeatedly dipping them in a bath of the electrolyte and finally washed with  $\text{H}_2\text{O}$  and then finished by repeatedly charging and discharging them.



**Diaphragms for electrolytic cells.** C. J. THATCHER. U. S. 1,291,253, Jan. 14. Diaphragms for electrolytic cells are formed of coarsely grained plates or cylinders of "filtros" or "alundum," the grains being bonded together only at their points of contact with each other. If the diaphragms are to be used in alk. solns. they are satd. with a soln. of a salt of a metal capable of yielding a gelatinous hydroxide, *e. g.*,  $\text{MgSO}_4$  soln., and then immersed in  $\text{NaOH}$  soln. to form a ppt. of the gelatinous hydroxide in the pores of the diaphragm, followed by immersion in  $\text{H}_2\text{O}$  to dissolve out the sol. salts, and are preserved in a moist condition, to prevent shrinkage of the gelatinous ppt., until desired for use. If the plates are to be stored for some time before use,  $\text{CaCl}_2$  or some other hygroscopic substance may be applied to their surfaces to prevent drying. The gelatinous ppt. in the pores of the diaphragm permits the free passage of ions of an alk. electrolyte but prevents access of fresh portions of alk. liquid to the diaphragm material so that the solvent action of the electrolyte is restricted to that exerted by the metal and hydroxyl ions electrolytically introduced into the plate. If the diaphragm is formed of "filtros" or other siliceous material, as soon as there is any soln., by caustic alkali, of the silica with formation of alkali metal silicate, the latter reacts with the adjacent  $\text{Mg}(\text{OH})_2$ , forming dense gelatinous Mg silicate as a coating around the siliceous particles of the diaphragm and preventing further action of the caustic alkali on them. Thus protected, "filtros" diaphragms can be used for long periods of time in hot alk. liquids without disintegration. Such diaphragms have an elec. resistance which (if they contain about 50% of voids) is about twice that of a body of electrolyte of the same dimensions as the plate. Diaphragms made as thus described cannot be used in ammoniacal nor in acid solns. For use in ammoniacal electrolytes, diaphragms are prepd. which are impregnated with gelatinous  $\text{Al}(\text{OH})_3$  or other metal hydroxide which is insol. in ammoniacal solns. Diaphragms for use with either acid or alk. electrolytes are formed by impregnating the "filtros," "alundum" or similar material with gelatinous Mg silicate or gelatinous Si hydrate.

**Electric arc furnace adapted for melting copper.** C. A. CADWELL. U. S. 1,290,902, Jan. 14.

**Effecting reactions in electric arc furnaces.** L. L. SUMMERS. U. S. 1,291,660, Jan. 14. An arc is formed in the furnace, a relatively inert gas, *e. g.*, N, is passed through the arc until it is highly heated, and a liquid to take part in the reaction, *e. g.*, liquefied O, is then injected into the arc together with a cooling liquid such as  $\text{H}_2\text{O}$ . The arc is thus extinguished and the products of the reaction are withdrawn immediately to a cooler region.

**Iron and steel manufacture.** E. HUMBERT. Brit. 121,674, Feb. 26, 1918. Fe or steel of any desired content of C, P, etc., is made in an elec. furnace from pig or cast Fe, or steel scrap, or both, by introducing the charge in a solid condition, applying the elec. current and bringing a current of air or equiv. oxidizing fluid into contact with the heated solid material, continuing the heating and the air, etc., supply until all the charge is melted, and refining the molten material to the desired product. In some cases, for oxidizing small quantities of C, the air may be applied to the molten material. Lime, and in some cases carbonaceous material or ore or other oxide, may be added to the charge. A furnace may be used which is specially fitted with air inlet ports and outlets for the products of combustion, or a furnace of the Heroult type may be used, in which air may be supplied from an ordinary blower through a pipe which is gradually raised as the charge of scrap and cast-Fe borings melts and is withdrawn when the entire charge is molten. The furnace is then closed and the refining completed.

## 5. PHOTOGRAPHY.

LOUIS DERR.

**Modern applications of photography.** ALFRED B. HITCHINS. Anso Research Lab., Binghamton, N. Y. *J. Franklin Inst.* 187, 129-46(1919).—An address, reviewing the application of photography to color-photography, spectro-photography, photomicrography, X-ray photography, and aeroplane photography. JOS. S. HEPBURN.

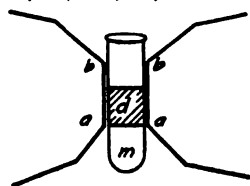
SCHMIDT, HANS: *Vorträge über Chemie und Chemikalienkunde für Photographierende, Ein Hilfsbuch zum Selbstunterricht für Amateure, sowie zur Vorbereitung zur Gehilfen- und Meisterprüfung für Fachphotographen.* 2nd Ed. enlarged. Halle (Saale), Germany: Wilhelm Knapp. 96 pp. M. 2.80, geb. 3.80. For review see *Chem. Weekblad* 15, 1666(1918).

**Colored medium for photographic plates or films.** S. E. SHEPPARD. U. S. 1,290,794, Jan. 7. The pat. relates to a method of forming dyed photographic color plates in which the dye is fixed in a medium from which it will not run or "bleed." The dye may be mixed with a soln. of nitrocellulose in amyl acetate emulsified with Turkey red oil and an aq. soln. of gelatin and the Turkey red oil and amyl acetate are then removed by addition of saline soln. or by a curdling by change of temp. and from the curdled material there is then formed a homogeneous emulsion of dyed particles of nitrocellulose suspended in gelatin which may be used for color screens of photographic plates and which is miscible with gelatin-AgBr emulsion. Cellulose acetate or other cellulose esters or ethers may be used instead of nitrocellulose.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**Magnetochemistry. Applications to analytical chemistry. II.** A. QUARTAROLI. Pisa. *Gazz. chim. ital.* 48, I, 65-78(1918).—In a previous paper (*C. A.* 11, 126) Q. showed how the detn. of magnetic susceptibility may be used to det. the amts. of magnetic salts present in a soln. The accuracy is as good or better than that of gravimetric or volumetric methods. Recently Q. has simplified the method so that weaker magnetic fields can be used. This makes the use of this method possible for Fe, Cr, Mn, Ni, Co and some rare elements. The process is described in detail for Fe.



The qual. test for Fe is made as follows: The 2 poles of an electromagnet having the general form given in the sketch and having semi-circular faces constitute a chamber into which an 8 mm. tube fits fairly closely so that as great a field may be obtained with the available current intensity as possible. The tube is filled with the magnetic soln. (*m*) and colored water (*d*) is added carefully on the top. On exciting the magnet the meniscus of *d* behaves differently, depending on the relative magnetic susceptibilities of solns. *d* and *m*. Since this phenomenon is clearly visible even with very dil. solns. of a magnetic salt on which water has been superposed as *d*, Q. took a known soln. of FeCl<sub>3</sub> and by observations of the behavior of the meniscus at fields of 5,000, 12,000 and 30,000 gauss he detd. the Fe content at various dilns. With the strong fields the results were accurately (0.00184%) observed at a concn. of 0.00200%. With the 5000 gauss field results were correct within 0.1% at a concn. of 0.0322%. In order to make an analysis the procedure is as follows: A suitable soln. of

$\text{FeCl}_3$  (3% Fe, for instance) containing enough  $\text{HCl}$  to prevent hydrolysis even on great diln. is prepared. A known portion of the soln. to be analyzed is boiled with a few drops of  $\text{HNO}_3$  (because the susceptibility of  $\text{Fe}^{++}$  is greater than that of  $\text{Fe}^{+++}$ ), freed from  $\text{SO}_4^{--}$  with  $\text{BaCl}_2$  ( $\text{FeSO}_4$  gives higher values than  $\text{FeCl}_3$ ) and placed in a buret. Portions of this soln. and  $\text{H}_2\text{O}$  from another buret are mixed in the tube and tested magnetically until one is obtained that behaves similarly to a known soln. prepared for the standard soln. The latter is now placed in the bottom of the tube as  $m$  and the compn. of the unknown used as  $d$  is so adjusted that the 2 layers show no change in the meniscus on exciting the magnet. By using a simple technic such as is used in weighing the adjustment of the upper soln. does not require numerous trials. If the Fe content is known approx. the analysis requires about 15 min. It is usually best to use some coloring matter in the upper soln. The presence of  $\text{Al}$ ,  $\text{PO}_4$ ,  $\text{SiO}_2$ , etc., do not interfere with the detn. of Fe in this way, but Mn and Co may. If the amt. of Mn present is small it can be detd. by one of the rapid colorimetric methods and subtracted from the value obtained for Fe without appreciable error. If Mn is present in large amts. it is better to convert it into  $\text{KMnO}_4$  (in the wet way) in which form it has practically no magnetic susceptibility. Mn in the presence of Ni and Co may be handled in the same way. In the presence of Cr the latter is first converted into magnetically little active chromates and the Fe detd. as described. The detn. of  $\text{CrCl}_3$ ,  $\text{MnCl}_2$ ,  $\text{NiCl}_2$  and  $\text{CoCl}_2$  is very similar to that of Fe by this method. With Cr and Ni the concns. of the solns. should be not less than 0.5 g. Cr per l. or 0.1 g. for the strongest fields. For Co salts the same concn. as was used for Fe may be used and for Mn even greater dilns. may be used. Good results could not be obtained with the salts of Cu. The magnetic method may also be indirectly used for inactive compds. which react with  $\text{KMnO}_4$  to produce Mn salts. In cases where the reaction products interfere with the end-point this method would be especially available. A known  $\text{MnCl}_2$  soln. is used as the standard. The detn. of Cr salts in the presence of the chromates, which are magnetically inactive, may be carried out analogously. Q. discusses the methods and difficulties of detg. ferrocyanides, ferricyanides, thiocyanates and org. compds. and describes their detn. magnetically. Ferrocyanides are diamagnetic and do not change their magnetic behavior sensibly in various concns. of  $\text{H}_2\text{O}$ . The ferrocyanides are distinctly magnetic and are easily detd. by the sensitive method here described if the concn. is as much as 0.3%  $\text{K}_3\text{Fe}(\text{CN})_6$ . Ferrocyanides are detd. by this method by oxidizing with Br water in excess and detd. magnetically. If ferricyanide was originally present also, the ferro-compd. is detd. by difference. The presence of org. compds. is without influence on the Fe detn. if the Fe is present as chlorides. To det. Fe by this method in the presence of  $\text{NH}_4\text{CNS}$  it is only necessary to oxidize the S to  $\text{H}_2\text{SO}_4$  with Br and proceed as usual.

E. J. WITZEMANN.

**Surface condensation (adsorption) of water vapor and gases, and the resultant errors in weighing.** K. SCHERINGA. *Pharm. Weekblad* 56, 94-107(1919).—Expts. with powdered paraffin,  $\text{Na}_2\text{SO}_4$ ,  $\text{NaCl}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{KClO}_4$ , pumice, etc., showed that adsorption of gases need not be considered a source of error in gravimetric work. Very fine powders, however, may adsorb  $\text{H}_2\text{O}$  vapor to a slight extent; thus, 50 g. of KBr gained 5 mg. in wt. from this cause. The literature on this subject is reviewed, and many references are given.

JULIAN F. SMITH.

**Notes on the rapid determination of lead in brass and alloys.** G. H. HOBGSON. *Chem. News* 118, 37-8(1919).—Two methods are proposed which are less elaborate and more rapid than the usual procedure. *Gravimetric method*: "Weigh out 5 g. of drillings into a 700-cc. conical beaker, dissolve in 25 cc. of  $\text{HNO}_3$  (d. 1.4), dil. with 200 cc. of water, add 20 cc. of  $\text{NH}_4\text{OH}$  (d. 0.88), or sufficient to ppt. the Cu as the hydroxide, and then add 20 cc.  $\text{AcOH}$  (80%), or enough to produce a clear soln. and leave a slight

excess of acid. Add 10 cc. of  $K_2Cr_2O_7$  soln. (3%), shake, and allow to stand for not less than 1 hr. Filter the pptd.  $PbCrO_4$  on a paper-pulp pad, wash with water to remove the bulk of Cu, pour on the pad hot douches of 30%  $H_2SO_4$  (about 40 cc. will be required) until the yellow chromate is completely converted to  $PbSO_4$ , and give a final washing with cold water. (A few drops of EtOH added to the pad before the  $H_2S$  will prevent any difficulty in conversion.) Take up the  $PbSO_4$  in hot  $AcONH_4$  soln. (containing free AcOH) by pouring about 40 cc. or so on to the pad and washing through into a clean 300-cc. conical beaker, bring soln. to the b. p., and carefully ppt. as  $Pb-MoO_4$  by the gradual addition of  $(NH_4)_2MoO_4$ , allow to settle, filter through an ashless paper pad, wash with water containing a little  $AcONH_4$ , ignite, and weigh as  $PbMoO_4$ . It is best to add the  $(NH_4)_2MoO_4$  a little at a time to be sure of complete pptn. Also when the Pb content is below 0.25%, the chromate pptg. is best done by adding the chromate after pptg. the Cu as the hydroxide and before the addition of AcOH. A complete analysis can be made in 4 hrs. *Volumetric method*: "The operations as far as the pptn. of the Pb chromate are the same as in the above. Filter the  $PbCrO_4$  on a paper-pulp filter and wash with warm dil. AcOH (5%) and water until free from Cu salts and excess chromate. Pour on to the pad cold HCl (1:4, free from Cl), allow to run into a clean 400 cc. conical beaker, and wash well with cold water until all chromic acid is completely washed through. The soln. will now measure about 150 cc. and will contain practically all the Pb as  $PbCl_2$ . The yellow chromic acid may now be titrated by either of the ordinary methods." It only requires about 2 hrs. for this method. Both methods show excellent checks with the gravimetric fuming method.

ERLE M. BILLINGS.

**Project for the unification of the methods of analysis of iron and steel.** A. MARI-NOT. *Ann. chim. anal. chim. appl.* 1, 5-10(1919).—M. recommends the following methods to the French Chemical Society: *Total C*: Wiborg method: direct combustion in elec. furnace, absorbing the  $CO_2$  in NaOH soln. and titrating back with  $H_2SO_4$  and phenolphthalein; Mahler and Goutal method (cf. *C. A.* 5, 3779; 6, 2727). *Silicon*: Practically the Drown method ( $HNO_3-H_2SO_4$  mixt.). *Manganese*: The method of Travers (cf. *C. A.* 11, 2866; 12, 1028). *Phosphorus*: The alkalinimetric method. *Sulfur*: The Rollet-Campredon process (igniting in a current of  $H_2S$ -free  $CO_2$ , and H, absorbing the  $H_2S$  formed in  $(AcO)_2Zn$  soln. and titrating with I and  $Na_2S_2O_3$ ). *Arsenic*: The Hollard and Bertiaux method (cf. *Ann. chim. anal.* 1900, 241) based on the distn. as  $AsCl_3$  and titration with I soln.

F. W. SMITHER.

**Note on the analysis of barite.** FRENKEL. *Ann. chim. anal. chim. appl.* 1, 10-2 (1919).—As  $BaSO_4$  is generally used for the manufacture of  $BaCl_2$ ,  $Ba(NO_3)_2$ ,  $BaCO_3$ ,  $BaO_3$ , and lithopone, its com. value in such cases should be based on the Ba content after reduction, although some  $BaSO_4$  may escape reduction and some Ba may be held as insol. silicate and as  $BaSO_3$ . To det. Ba heat 1 g. of the finely powdered barite in a Rose crucible to bright redness for 15 min. in a current of illuminating gas, let cool in the gas current, and leach with boiling  $H_2O$ ; filter, wash, acidify with dil. HCl, expel  $H_2S$  and ppt. the Ba with dil.  $H_2SO_4$ . If the barite contains  $CaSO_4$ , the latter should be removed before detg. total Ba, or sol. Ba after reduction, by treating 1 g. of the finely powdered mineral with 50 cc. of  $H_2O$  at  $38^\circ$ ; then det. Ca in the aq. ext. and Ba in the residue. F. has had samples of barite containing as much as 10% of org. matter.

F. W. SMITHER.

**Determination of nitrites.** F. DIENERT. *Ann. chim. anal. chim. appl.* 1, 4-5 (1919). Unless air is excluded the iodometric method ( $NaNO_2 + 2HI = NaI + I + NO + H_2O$ ) gives results 10 to 15 times too high. To obviate this D. operates as follows: Pass a current of  $CO_2$  from a Kipp generator through a soln. of  $NaHCO_3$  in a flask, then into a flask containing 50 cc. of 4% KI soln., and finally into a flask

containing the nitrite soln. and provided with a separatory funnel; the exit tube from this flask dips into  $H_2O$ . After 15 min., introduce 10 cc. of  $N H_2SO_4$  through the funnel and lower the exit tube from the second flask so that the  $CO_2$  will force the  $KI$  soln. over into the nitrite soln.; then introduce through the funnel 10 cc. of 20%  $(NH_4)_2CO_3$  soln.; disconnect the last flask and titrate the free  $I$  with 0.143  $N As_2O_3$  soln. (the  $H_2SO_4$  and  $(NH_4)_2CO_3$  are freed from  $O$  by  $CO_2$  before use). The max. error with 3 mg. of  $N$  as nitrite is 2%. Also in *Compt. rend.* 167, 366-7(1919). F. W. SMITHER.

**The accurate determination of carbon monoxide in gas mixtures.** J. IVOR GRAHAM. *J. Soc. Chem. Ind.* 38, 10-4T(1919).—Methods of estg.  $CO$  based on the reaction  $5CO + I_2O_5 = 5CO_2 + I_2$  are capable of giving exceedingly accurate results. Some modifications are proposed in procedure and app. described in *C. A.* 9, 183. Full details are given of methods for gas mixts. containing  $CO$  in various proportions and for the application of these methods either in the lab. or in the field. Line drawings are shown of the modified Haldane's app. for the lab. and field. ERLE M. BILLINGS.

**A rule for chemical calculations.** PAUL NICOLARDOT. *Chimie et industrie* 2, 25-6(1919).—A meager description accompanied by poor cuts of a rule by the aid of which one or two operations can be saved in some calcns. ERLE M. BILLINGS.

**The alkali iodides as reagents for cadmium and nickel.** A. AGRESTINI. Univ. Urbino. *Gazz. chim. ital.* 48, II, 30-4(1918).—Salvadori (*C. A.* 10, 1483) showed the value of the ammoniacal metallic perchlorates in the detection of  $Cd$  in the presence of  $Cu$ , and of  $Ni$  with  $Co$ .  $Cd$ ,  $Ni$  and  $Co$  in ammoniacal solns. behave similarly with alkali iodides. A soln. of  $Cd$  salts strongly ammoniacal treated with a 20-30% soln. of  $KI$  gives a white heavy ppt. of  $Cd(NH_4)_2I_2$  at once in concd. solns. and slowly in more dil. ones. The salts of  $Cu$  under similar conditions give no ppt. except when mixed with  $Cd$ , and the ppt. is then due to the latter. This ppt. may be washed, on the suction plate, with small amts. of dil.  $NH_4OH$ , then  $EtOH-NH_4OH$ , then 94%  $EtOH$  and dried in a desiccator over  $CaO$ . The ppt. is the  $Cd(NH_4)_2I_2$  discovered by Rammelsberg and obtained by Naumann (*C. A.* 4, 1851) by the action of  $NH_3$  on  $AcOEt$  solns. of  $CdI_2$ . Even in strongly ammoniacal solns. of  $Ni$  salts the concd. alkali iodide solns. give copious ppts. of bluish violet heavy  $Ni(NH_4)_2I_2$  and, as in the case of the  $Cd$  pptn., this is nearly quant. This compd. is also subject to hydrolysis, but may be handled as described for the  $Cd$  salt. Pptd. from fairly concd. solns. it is blue-violet in color, but is it nearly white when pptd. from solns. of say 1 g.  $Ni(NO_3)_2 \cdot 6H_2O$  in 2 l.  $H_2O$ . Solns. containing  $Co^{+}$  ions similarly treated give a yellow-red ppt. having a similar compn. probably. This test may not be used directly to detect  $Ni$  in the presence of  $Co^{+}$ . By previously transforming the  $Co^{+}$  into cobaltamine with  $H_2O_2$ ,  $NH_4OH$ , etc., the  $Ni$  could generally be satisfactorily sepd. with alkali iodide as  $Ni(NH_4)_2I_2$ , but it was better first to sep. the  $Co$  as potassic cobaltic nitrite or to remove it by Vogel's reaction with  $NH_4CNS$ . After this treatment the test was always satisfactory. The alkali bromides react with ammoniacal  $Ni^{+}$  and  $Co^{+}$  solns. to give ppts. that are probably  $Ni(NH_4)_2Br_2$  and  $Co(NH_4)_2Br_2$ , resp., having a similar color, but they are more sol. in  $H_2O$  than the  $I$  compds.  $Cd$  does not give an appreciable ppt. with alkali bromides. E. J. WITZEMANN.

**Pyridine and ammonia, estimation and separation—an application of the electrolytic dissociation theory.** E. B. R. PRIDEAUX. *Trans. Faraday soc.* 1919 (advance copy), 10 pp.—Methyl red, lacmoid, litmus, red cabbage, *o*-nitrophenol, lacmoid, or any other indicators or mixtures of indicators changing between the exponents 4 and 8 are suitable for the titration of pure ammonia solns. Pure pyridine solns. are best titrated with  $HNO_3$  in the presence of Congo. Methyl violet gives much the same result. In mixts. of the 2 bases,  $\alpha$ -naphtholphthalein (cf. Werner, *C. A.* 12, 677) is

used for the ammonia and the end-point is taken at the color change from blue to greenish blue or nearly colorless; for the pyridine, Congo is then added and the  $\text{HNO}_3$  addition continued until the reddish color changes to a purple brown. In such mixts., the results for ammonia are satisfactory but tend high, while pyridine shows a high alkalinity in the presence of  $\text{NH}_4$  salts. The bases may be sepd. and estimated by distn. as follows: To the mixt. normal  $\text{HNO}_3$  is added until Congo turns purple, then di-Na H citrate (about 0.4  $M$ ) until the color is red-brown. The soln. is then distd. through a splash bulb and condenser into a water-sealed exit. The first 50 cc. may be collected in normal  $\text{HNO}_3$ . More citrate is added if the soln. is blue and more Congo if this is pptd. Successive distillates are collected in open flasks or beakers until they contain no pyridine. The distg. flask is then treated with an excess of alkali. The pyridine, pyridine-ammonia mixts., and ammonia obtained in the various distillates are then titrated as above. The method was developed by the aid of calcs., based upon the electrochem. theory.

WILBERT J. HUFF.

**Micro elementary analysis of organic substances.** J. V. DUBSKY with E. DINGEMANSE and A. GLATTFELDER. Univ. Zurich. *Helvetica Chimica Acta* 2, 63-75(1919).—(a) *Micro-Dumas*: It was found that  $\text{CO}_2$  from a Kipp app. is inferior to that obtained by heating a tube of  $\text{NaHCO}_3$  because of the absorbed and adsorbed air in the former; any leaks in the app. cause high results. A new form of micro-azotometer is described and illustrated in which only a small amt. of Hg is necessary as a seal; the addresses of firms supplying this piece of app. are given. (b) *C and H determinations*: For compds. containing nitro groups the previously described tube was used with an oxidized Cu spiral before the combustion boat as in macro analysis; explosive substances as picric acid and trichlorodinitrobenzene were found to give high values; this was partially overcome by the use of  $\text{PbO}_2$  (cf. following abstr.). Explosive nitro compds. may also be analyzed by placing a boat containing a known wt. of benzoic acid or sucrose before the boat with the nitro compd.; these substances act as reducing agents and partially reduce the CuO which then functions as a reduced Cu spiral; the wt. of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  is then corrected by an amt. equal to that calcd. from the known quantity of benzoic acid or sugar used (cf. *Am. Chem. J.* 23, 343(1901)). Reduced Cu spirals should never be used in micro-analysis because even when dried at  $120^\circ$ , the Me alc. reduced spirals still contain sufficient amts. of formaldehyde to give poor results; spirals reduced with H still have traces of adsorbed water.

N. A. LANGE.

**Micro elementary analysis of compounds containing sulfur, halogen or nitro groups. The double combustion.** CH. GRÄNACHER. Univ. Zurich. *Helvetica Chimica Acta* 2, 76-84(1919).— $\text{PbO}_2$  is used to remove the S, Cl and  $\text{NO}_2$  groups. A somewhat longer tube than usually employed in micro-analysis is filled at the absorption end with  $\text{PbO}_2$ , followed by sections of Ag wire, CuO and  $\text{PbCrO}_4$  mixt., then a second Ag wire. The  $\text{PbO}_2$  end of the tube is surrounded by an aniline jacket fitted with a reflux condenser which maintains the temp. of the  $\text{PbO}_2$  at  $175-80^\circ$ . At the beginning of the combustion the aniline is heated to boiling after which heating is no longer necessary because of the heat supplied through the combustion tube during the analysis. In this manner the temp. at which  $\text{PbO}_2$  is most effective is automatically maintained. The double combustion is nothing more than two combustion tubes placed within the same furnace, each connected to the usual absorption app. In this way the time for many analyses is considerably shortened.

N. A. LANGE.

**Publications on military sanitation.** 72. Contributions from the hygienic-chemical research laboratories, Pt. IX. *Pharm. Weekblad* 56, 74-7(1919).—This publication describes the work of various German military pharmacists, carried out in different institutional and camp laboratories during the war. Ten contributions are reported: 1. The detection of free sulfuric acid in leather, especially after the use of artificial tanning

*agents.* H. STRUNK and O. MATTHES.—To det. free  $H_2SO_4$  in leather, add  $HNO_3$ , add a known amt. of  $Mg(NO_3)_2$  and ignite until all the Mg is converted to  $MgO$ . Detn. of the amt. of  $MgO$  left will show the amt. fixed by  $H_2SO_4$ . Artificial tanning agents, as Neradol D or ND, Ordoval G, sulfite cellulose lye, etc., often contain  $H_2SO_4$  either free or in org. combination. In either case it is harmful to the leather and should not be overlooked. 2. *The analysis and evaluation of tinned meat.* H. SERGER.—Rubber and paper packing rings were examd. with reference to compn., chem. and physical properties, behavior on sterilization, stability to boiling in different solns., etc. Paper rings are an excellent substitute for those of rubber. Methods of analysis of the cans and their contents are also discussed. 3. *Marmalades and war jams.* H. SERGER.—Studies of consistency, taste, chem. compn., relation of sugar content to stability, etc. 4. *Preserving vegetables in kegs, and a comparison of their composition.* H. SERGER.—Vegetables can be preserved by acid formation (as sauer kraut), by salting down, or by means of chem. preservatives. The last is preferable;  $NaOBz$ , with a few % of  $NaCl$ , is recommended as the preservative. With the salt method, there is considerable loss in washing out the brine. 5. *The loss of fat and sugar in baking biscuit and pastry.* E. ALPERS.—The loss of fat in baking is negligible; the loss of sugar does not exceed  $1/7$  of the amt. originally present. 6. *The analysis of kitchen and table ware and of tins for canned foods.* E. SEEL and K. HILS.—Too much Pb (1.27–4.44%) was found in 15–20% of the tin coatings examd. No Pb was found in enameled coatings, but a few contained Zn. Some ware is enameled with bakelite. If prolonged treatment with 40% EtOH exts. no PhOH from such ware, it is satisfactory. In normal times, tin cans had 2.0–2.5 mg. of Sn per sq. cm., but in the latter years of the war, they had only 1.0–1.5 mg. per sq. cm. 7. *The microscopic detection of food and drink adulterants and substitutes of vegetable origin.* C. GRIEBEL.—A discussion of adulterants and substitutes for bread, flour, marmalades, etc., spices, coffee, tea, and tobacco. 8. *The juice of the Russian cranberry.* C. GRIEBEL and A. SCHÄFER.—The glucoside vaccinin, monobenzoylglucose, was found in cranberry ext. captured from the Russians. This glucoside had been previously found in the fruit of several varieties of *Vaccinium*. 9. *The evaluation of cresolin-cresol and crude cresol solutions.* H. FINCKE. A 1–2% soln. of cresol or cresol and Na cresotate is particularly adapted to the disinfection of articles of wool and leather. The analysis of such solns. is discussed. 10. *The preparation and purification of fat from bones.* D. SCHENK.—Describes 2 methods of prep. an edible fat from bones. JULIAN F. SMITH.

#### Preparation of soluble starch (LEULIER) 28.

EYDMAN, F. H., JR.: Tabellen voor het scheikundig onderzoek van anorganische stoffen. 7th Ed. Delft: J. Waltman, Jr. 38 pp. f. 2.60 + 10% toeslag. For review see *Chem. Weekblad* 16, 131(1919).

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

Contribution to the mineralogy of boron, lithium and thallium in volcanic exhalations. ALBERT BRUN. *Bull. soc. franc. min.* 40, 107–10(1917).—The salts produced by the eruption of Vesuvius in 1906, consisting of  $NH_4(Cl, F)$ , show the flame color and spectrum of B. The leucite-tephrite rock of Vesuvius contains Li, and this has also been obtained as  $LiCl$  on evapg. a  $H_2O$  extract of the scoria of 1906. Tl occurs in all fumarolic salts, As-sulfides, and red scorias of Vesuvius, and has also been detected in

the  $\text{NH}_4$  compds. at Chinyero, Teneriffe, and in red scoria at the Spagnuolo crater, Etna. The Tl occurs in sol. and insol. compds., in S, and in unknown compds. The amts. of these elements are about 1 or 2/4000. The compds.  $\text{Tl}_2\text{S}$  (and  $\text{TlCl}$ ) should be recognized as minerals of volcanic origin. E. T. W.

**The thioarsenides of the Binnenthal.** ALBERT BRUN. *Bull. soc. franc. min.* 40, 110-1 (1917).—Spectroscopic tests made on the thioarsenides from the Binnenthal have shown the presence of Tl in every case, although no Tl-bearing mineral could be detected as an admixture. This occurrence is analogous to that at Vesuvius.

E. T. W.

**A remarkable occurrence of chromium tourmaline and rutile in the Barberton District.** A. L. HALL. *Trans. Geol. Soc. S. Africa* 20, 51-2 (1918).—An occurrence of green Cr-tourmaline with pink rutile and talc is described. It forms a coarsely crystd. green rock, associated with talcose schists and serpentine in which occur many narrow bands of grayish gneissic offshoots from intrusive granites. S. G. G.

**A noteworthy occurrence of biotite mica.** EVAN R. STANLEY. *Trans. Proc. Roy. Soc. S. Australia* 40, 268-71 (1917).—The black biotite associated with "davidite" when exposed to atmospheric conditions for a few months becomes coated with carnotite. The mean of 3 analyses gave:  $\text{SiO}_2$  38.66,  $\text{Al}_2\text{O}_3$  17.33,  $\text{Fe}_2\text{O}_3$  9.85,  $\text{FeO}$  5.59,  $\text{MgO}$  14.97,  $\text{CaO}$  none,  $\text{Na}_2\text{O}$  2.76,  $\text{K}_2\text{O}$  5.59,  $\text{H}_2\text{O}$  (chiefly loss on ign.) 2.47,  $\text{TiO}_2$  (combined) 0.03,  $\text{TiO}_2$  (included rutile needles) 1.32,  $\text{Cr}_2\text{O}_3$  0.61,  $\text{MnO}$  tr.,  $\text{F}$  0.77,  $\text{V}_2\text{O}_5$  tr., sum 99.95, less O 0.32 for F = 99.63%. S. G. GORDON.

**Mineral notes.** D. MAWSON. *Trans. Proc. Roy. Soc. S. Australia* 40, 262-6 (1916).—Monazite occurs associated with tourmaline, apatite, cordierite, autunite, torbernite, zeunerite, gummite and carnotite in a corundum-mica-schist between Mounts Pitt and Painter, in the Flinders Range; it is apparently the result of the action of gaseous or liquid magmatic solns. on the surrounding rocks. Cordierite, sillimanite and spinel also occur in the corundum-mica-schist of the district. Titanite occurs in large crystals in a gabbro pegmatite below Mount Gee. Australian occurrences of octahedrite, gypsum, lodestone, and davidite are noted. S. G. GORDON.

**Chemical notes on davidite.** W. T. COOKE. *Trans. Proc. Roy. Soc. S. Australia* 40, 267 (1917).—Davidite occurs in radioactive ilmenite, with magnetite, rutile, biotite and carnotite, at Radium Hill, 20 miles E. S. E. of Olary Sta. Analysis gave:  $\text{TiO}_2$  54.3,  $\text{FeO}$  16.0,  $\text{Fe}_2\text{O}_3$  13.0, rare earths 8.3, ( $\text{V}_2\text{O}_5$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{U}_3\text{O}_8$ ) 4.6,  $\text{MgO}$  0.6,  $\text{CaO}$  1.5,  $\text{PbO}$  1.1,  $\text{CuO}$  tr.,  $\text{H}_2\text{O}$  1.5, sum 100.9%. The rare earths contain much Ce, but little Th. The presence of La, Di, Er, Yt and Sc was shown chemically or spectroscopically; Zr is absent. On heating to redness, 100 g. yield 15 cc. He. S. G. G.

**Chemical properties of Utah hydrocarbons.** C. BARDWELL, B. A. BERRYMAN, T. B. BRIGHTON AND K. D. KUHR. *Trans. Utah Acad. Sci.* 1, 78-95 (1918).—About 15 hydrocarbons occur in Utah, 5 of which were investigated: gilsonite, tabbyite, wurtzellite, ozokerite, and rock asphalt. Gilsonite (uintaite) is limited to the Uncompahgre Reservation, Uinta Co., occurring as filling in vertical fissures in the Green River (Eocene) calcareous shales, limestones and sandstones. Tabbyite occurs in the Tabby Canyon, Uinta Co., in vertical fissures in Upper Tertiary sandstones and shales. Wurtzellite (elaterite, mineral rubber) occurs in an area of 100 square miles between Indian Canyon and Sam's Canyon, north of Price, in vertical veins 1 to 22 in. wide, with a max. length of  $3\frac{1}{4}$  miles, midway in the Green River formation. Ozokerite (mineral wax) occurs in an area west of Cotton, Utah Co., in shales, shaly sandstones, and limestones, in the lower part of the Wasatch Formation (Tertiary), chiefly in fissures and spaces in zones of brecciation and jointing. Rock asphalt (bituminous sandstone) occurs in large deposits south and east of Vernal, southeast of Thistle, near Sunny-



side, at the head of Willow Creek, near Jensen, west of Clear Creek, and north of Colton. In the field one asphalt gradually changes to another. There may be a genetic relation among the hydrocarbons. The physical and chem. properties of the 5 hydrocarbons are tabulated, also their soly. in various solvents, the results of fractional distn., with 8 analyses of their ultimate compn. The literature on the deposits is reviewed, and the uses of the hydrocarbons are listed. S. G. GORDON.

**Microscopic secondary sulfide enrichment in the "Kuromono" ore from the Kosaka mine, Province Rikuchu, Japan.** TAKEO KATO. *J. Geol. Soc. Tokyo* 25, No. 295, 1-7(1918).—A microscopic intergrowth of bornite, chalcocite and covellite is described, occurring as secondary sulfides deposited by descending cupriferous solutions. The bornite and chalcocite were formed contemporaneously at the expense of pyrite and chalcopyrite, while in some places bornite has replaced chalcocite. S. G. G.

**The veins of Chañarcillo, Chile.** W. L. WHITEHEAD. *Econ. Geol.* 14, 1-45(1919).—The geology of the district is fully discussed. The primary ores were first deposited in veins from solns. of probable igneous origin and were arsenides, thioarsenides, and thioantimonides of Ag, along with gang minerals. Subsequent repeated oxidations and enrichments by supergene solns. of atmospheric origin during a period of erosion gave rise to the bonanza ore bodies, composed of chlorides, bromides and iodides of Ag, native Ag, and dyscrasite in the upper zone and native Ag, dyscrasite, argentite, stephanite, and other sulfides in the lower zone. A bibliography and several photomicrographs are appended. A. B. PECK.

**The ores of manganese and iron of the crystalline massif of Brosteni, Roumania.** V. C. BUTUREANU. *Bull. soc. franc. min.* 40, 164-77(1917).—The geology of the region and occurrence of the ores are described and methods of analysis given. Analyses of Mn-Fe carbonates from several localities show approximately a constant ratio, Mn:Fe = 5:1, and the name "ponite" is applied to these. Another carbonate had the ratio 1:2. Alteration products of these minerals are shown by a number of analyses to have the general formula  $RO \cdot xMnO_2 \cdot yH_2O$ . Such material is termed brostenite. The use of these substances as ores is discussed. E. T. W.

**Experiments relating to the enrichment of tungsten ores.** R. W. GANNETT. *Econ. Geol.* 14, 68-78(1919).—The purposes are to det. (1) the effects of various solns., found in ground waters, on W minerals, and (2) what natural reagents might ppt. W from soln. Only commercial ores, scheelite and the wolframite series, ferberite—hübnerite, are considered. The results of a large number of leaching and pptn. expts. with chlorides, carbonates, sulfates, alkali hydroxides and combinations of these are tabulated and discussed in their relation to field evidence. The general conclusions are: associated minerals usually dissolve more easily than W minerals, and enrichment comes about by the removal of worthless material. W minerals may dissolve, forming sol. salts and colloidal solns., and remove W from the outcrop. W may be leached from ores and not be redeposited below. The ease with which W compds. hydrolyze and form insol. compds. tends to prevent downward migration of W, and there probably are no extensive zones of W minerals as in the case of Cu or Ag, although enrichment by soln. and repptn. probably does occur somewhat.  $Fe_2(SO_4)_3$  slows down and stops soln. and migration of W. Secondary W ores are usually hübnerite and wolframite, rather than scheelite. A. B. PECK.

**The barite deposits of Missouri.** W. A. TARR. *Econ. Geol.* 14, 46-67(1919).—See C. A. 13, 551-2. A. B. PECK.

**A system of petrography.** S. J. SHAND. *Geol. Mag.* 4, 463-9(1917).—S. reviews the mineralogical classification of igneous rocks of Holmes (C. A. 11, 3215) and proposes a modified system based on the degree of satn. of the rock with regard to silica.

Five main divisions occur: (1) Oversaturated rocks (containing free quartz), (2) satd. rocks, (3) unsatd. rocks: (a) dyad and triad metals unsatd., (b) monad metals unsatd., (c) both monads and dyads unsatd. The following taxonomic factors are applied: the degree of satn. as above noted, the double ratio of orthoclase-albite-anorthite, the color ratio of light to dark minerals, crystallinity, ratio of specific minerals, and finally trivial characters of mineralogy and texture, giving varieties.

\* S. G. GORDON.

**The petrography of Arran.** 3. Pitchstone xenoliths in basalt dyke, Dippin, Arran. G. W. TYRRELL. *Geol. Mag.* 3, 193-6(1916).—The rock is an andesitic basalt, distinguished by containing phenocrysts of anorthite or bytownite in a ground mass composed of laths of labradorite, augite frequently intergrown with enstatite and hypersthene; and an abundant mesostasis of dark glass. The xenoliths are largely pitchstones, surrounded by a skin and sometimes clots of glass darkened by streaks and patches of dark dots, chiefly hematite, arranged with fluxional structure. From the effect of the heat on the phenocrysts of the pitchstone, the temp. of the basaltic magma during intrusion is estd. as between 1,170 and 1,375°. S. G. GORDON.

**Albite-granophyre and quartz-porphyr from Brandy Gill, Carrock Fell.** ARTHUR HOLMES. *Geol. Mag.* 4, 403-7(1917).—A petrographic description. The granophyre was analyzed by H. S. Harwood, and the analysis indicated that the Fe content was too high for glass manuf. S. G. GORDON.

**The Pahang series.** E. S. WILLBORUN. *Geol. Mag.* 4, 447-62, 503-14(1917).—The series includes rhyolite, trachyte, andesite, quartz-porphyr, granophyre, porphyrite, quartz dolerite, dolerite, and rhyolite, rhyolite-andesite, and andesite tuffs. These rocks are described, and one analysis of andesite is given. S. G. GORDON.

**The geology of Mount Remarkable, with petrographic notes on the basic igneous rocks at the foot hills of Mount Remarkable.** WALTER HOWCHIN AND E. O. THIELS. *Trans. Proc. Roy. Soc. S. Australia* 40, 545-83(1916).—The formations comprize Lower Cambrian limestones, slate, glacial tillite, quartzite and igneous rocks, and Upper Cambrian slate and quartzite. The igneous rocks occur as disconnected pipes on the southeastern side of the Mount, and include dolerite, altered basalts, acid porphyritic rocks and aplites. An analysis of quartz-keratophyre is given. S. G. GORDON.

**The chemical composition of vaugnerite and the position of this rock in the classification.** A. LACROIX. *Bull. soc. franc. min.* 40, 158-62(1917).—Two new analyses of this rock are given, and recalcd. into the mineral compn. It is found to be a monzonitic rock, and is comparable with kentallenite. The rock from a dike which cuts the body of vaugnerite has also been analyzed, and on comparison of its compn. with that of absarokite, the dike rock is found to be essentially a lamprophyric absarokite.

E. T. W.

**Preliminary notes on the lava of Volcano Sambe.** TADAO FUKUTOMI. *J. Geol. Soc. Tokyo* 25, No. 295, 10-25(1918).—The lava is a porphyritic light-colored dacitic andesite. It is described in detail with analyses of the rock and of its plagioclase, hornblende, and mica. S. G. GORDON.

**Notes on miharaite.** SEITARO TSUBOI. *J. Geol. Soc. Tokyo* 25, No. 302, 47-58 (1918).—Miharaite is the name given to an aphanitic rock found in the central cores of Oshima. The rock is composed of megaphenocrysts of calcic bytownite ( $\text{Ab}_{40}\text{An}_{60}$ ) with the  $n_s$ :  $\alpha < 1.572 < \beta < 1.578 < \gamma$ , with a few of hypersthene and clinohypersthene, in a gray percrystalline or docrystalline and decimillimeter-grained groundmass of plagioclase, augite grains, magnetite, apatite (extremely rare) and a negligible amount of glass. In slaggy parts the rocks is hyalocrystalline plagioclase and augite swimming in a brown mass. Av. of 4 analyses:  $\text{SiO}_2$  51.45,  $\text{Al}_2\text{O}_3$  16.84,  $\text{Fe}_2\text{O}_3$  1.49,  $\text{FeO}$  10.95,

MgO 4.48, CaO 10.71, Na<sub>2</sub>O 1.23, K<sub>2</sub>O 0.37, H<sub>2</sub>O 0.72, TiO<sub>2</sub> 1.27, P<sub>2</sub>O<sub>5</sub> 0.26, MnO 0.19, sum 99.96%. S. G. GORDON.

**Graphic granite.** JACQUES DE LAPPARENT. *Bull. soc. franc. min.* 40, 111-5 (1917).—Because of the resemblance in structure to certain alloys and the apparent constance of the proportion of quartz to feldspar, geologists have been inclined to regard graphic granite as an eutectic. Observations on various occurrences have led L. to discard this view. In a true eutectic any excess of either mineral would crystallize out first, whereas the graphic granite itself is always the first to solidify in pegmatite veins. The rock is, however, capable of explanation by the Soret principle, that in a homogeneous liquid, material diffuses toward a cool region. The pegmatite magma being practically a satd. soln. of quartz and feldspar, there must be a constancy, though only relative, of the constituent minerals. E. T. W.

**A new ferriferous type of crystalline schist, collobrérieite.** A. LACROIX. *Bull. soc. fran. min.* 40, 62-9 (1917).—The Fe-bearing schists at Collobrières have been previously known to contain unusual Fe silicates, and a new collection of specimens has yielded further data on these. The microscopic characters of the rock are described, and an analysis by Raoult is given, which on recalcn. yields the mineral compn.: gruen-erite 43.7, fayalite 21.1, garnet 16.6, ilmenite + magnetite + pyrite + pyrrhotite 17.5, and apatite 1.1%. The nearest previously described rock is eulysite from Tunaberg, Sweden, but the present material is different from that in origin, so the new name *collobrièreite*, after the locality, is proposed for the rock type. Considerable variation from the compn. above described occurs from one specimen to another. Siderite, apparently of secondary derivation from the fayalite, is at times abundant. Apatite and magnetite also locally increase in amount, the latter being often in peculiar porphyritic forms, and being notable for the low Ti content. E. T. W.

**The application of petrological and quantitative methods to stratigraphy.** P. G. H. BOSWELL. *Geol. Mag.* 3, 105-11, 163-9 (1916).—A discussion of the sepn. of the minerals of sediments by panning and the use of heavy liquids, and a petrographic study of those so occurring, their size, form, degree of alteration, and relative abundance. Detrital mineral assemblages are believed to be of considerable value for stratigraphical purposes over limited areas. S. G. GORDON.

**Notes on diatomaceous earth from Lord Howe Island.** WALTER HOWCHIN. *Trans. Proc. Roy. Soc. S. Australia* 41, 659-60 (1917).—The rock was washed up on the beach, and is excessively fine and remarkably uniform, with a few brown specks shown to be fish scales. A microscopic examn. showed that the earth consisted of very finely divided flocculent matter in which were imbedded great numbers of diatoms, sponge spicules and a few radiolaria. Foraminifera were absent. Analysis by W. S. Chapman gave: moisture 3.7, combined H<sub>2</sub>O and organic matter 5.7, SiO<sub>2</sub> 63.8, Al<sub>2</sub>O<sub>3</sub> 5.9, Fe oxide 3.0, CaO 2.2, MgO 7.9, alkalies not detd., sum. 92.2%. S. G. G.

**The singing sand of Koto-ga-hama, Iwami.** SEITARO TSUBOI. *J. Geol. Soc. Tokyo* 25, No. 295, 8-9 (1918).—This sand is said to utter a sweet sound when tread upon. The size of grain varies from 0.28 to 0.95 mm., and is composed almost wholly of oligoclase-andesine feldspar (Ab<sub>77</sub>An<sub>23</sub> — Ab<sub>70</sub>An<sub>30</sub>) with minor amts. of orthoclase, hornblende, hypersthene, magnetite, quartz, and shelly matter. S. G. GORDON.

**The iodine and bromine content of a sample of water from Lake Gairdner.** W. TERNENT COOKE. *Trans. Proc. Roy. Soc. S. Australia* 41, 39-40 (1917).—Analysis showed that 1 l. of lake water contained 0.0005 g. I and 0.07 g. Br. S. G. GORDON.

**Native supplies of refractory materials available in the Sheffield district.** W. G. FEARNSIDES. *Trans. Eng. Ceram. Soc.* 17, 271-92 (1918).—A general description of the deposits considered chiefly from the geologic standpoint. C. H. KERR.

Radioactivity of Italian minerals (FRANCESCONI, *et al.*) 3. The orientation of anisotropic liquids in contact with crystals (GRANDJEAN) 2. Structure of crystals in extremely thin plates (MARCELIN) 2.

KEMP, JAMES F.: *Handbook of Rocks for Use without the Microscope*. 5th Ed. revized. New York: D. Van Nostrand Co. 272 pp. \$1.50.

WADE, FRANK B.: *A Text-book of Precious Stones*. G. P. Putnam's Sons. 318 pp. For review see *Science* 44, 217(1919); *Am. Minerals* 4, 26(1919).

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Secondary metals in 1917. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 299-330 (preprint No. 15, published Feb. 19, 1919); cf. C. A. 12, 34. E. H.

The production of iron and steel in Canada during the calendar year 1917. JOHN McLEISH. Can. Dept. Mines, Mines Branch. *Adv. Chapter of the Annual Rept. on the Mineral Production of Canada during 1917*, No. 498, 32 pp.(1919); cf. C. A. 12, 1279. E. J. C.

The production of copper, gold, lead, nickel, silver, zinc, and other metals in Canada during the calendar year 1917. ARTHUR BUISSON. Can. Dept. Mines, Mines Branch. *Adv. Chapter of the Annual Rept. on Mineral Production of Canada during 1917*, No. 497, 71 pp.(1919); cf. C. A. 12, 1279. E. J. C.

Gold, silver, copper, lead and zinc in California and Oregon in 1917. CHARLES G. YALE. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 203-52 (preprint No. 13, published Feb. 18, 1919); cf. C. A. 12, 349. E. H.

Gold, silver, copper, lead and zinc in Nevada in 1917. V. C. HEIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 253-98 (Preprint No. 14, published Feb. 18, 1919); cf. C. A. 12, 576. E. H.

Gold, silver, copper, lead and zinc in Montana in 1917. V. C. HEIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 331-66 (preprint No. 16, published Feb. 21, 1919); cf. C. A. 12, 464. E. H.

Quicksilver in 1916. H. D. MCCASKEY. U. S. Geol. Survey, *Mineral Resources of U. S., 1916*, Part I, 757-73 (preprint No. 24, published Feb. 19, 1919). E. H.

Fume and other losses in condensing quicksilver from furnace gases. L. H. DUSCHAK AND C. N. SCHUETTE. *Bur. Mines, Tech. Paper* 96, 29 pp.(1919).—The no. of *Tech. Paper* given in C. A. 13, 415, is incorrect. E. H.

Defining "tailings" and "residues." A. W. ALLEN. *Eng. Mining J.* 107, 317 (1919).—The following definitions are proposed: "*Tailing*: The material from which one or more concd. products have been removed, and which is available for further treatment. *Residue*: The waste or final product from a hydrometallurgical plant which, at the time of operation, is valueless as far as metal content is concerned."

F. W. SMITHER.

Influence of temperature upon the action of slag upon refractory materials. R. M. HOWE. *Chem. Met. Eng.* 20, 167-8(1919).—H. reports results obtained with 6 different slags and 3 standard brands of firebrick. The method of procedure is practically the same as that followed by Nesbitt and Bell (cf. C. A. 10, 2972). In each case the slag penetrated more deeply into the brick at higher temps. In several cases an

increase of 100°, or less than 10%, resulted in nearly doubling the penetration. H. concludes that "it appears very much as if the relation of output and the life of the lining is similar to the rate of driving and the life of an automobile." The lives of furnace linings should be compared according to a sliding scale. F. W. SMITHER.

**Flocculation in flotation.** C. C. SMITH AND A. R. PICKETT. *Eng. Mining J.* 107, 365-6(1919).—Discussion of a paper by G. J. Young (*C. A.* 13, 412). The authors point out that Y. has overlooked the fact that NaOH is a strong electrolyte. Acid is often beneficial in flotation, usually by the formation of a more selective froth; in many cases it is found to be detrimental to froth formation, and some ores give better results when an alk. pulp is used. The authors have made careful microscopic examn. of over 2000 mineral-bearing froths formed from a number of different ores and with a wide variety of frothing agents, and in few cases has there been noticeable any flocculation of the mineral. In practically all cases the mineral exists in the film in the form of distinct, individual particles. When sufficient oil is used to cause cohesion of the sulfide particles, granulation will result under proper conditions. Such granulation is detrimental to froth formation. Flocculation, which is incipient granulation, is detrimental to both froth formation and the recovery of the mineral; whenever mineral floccules are apparent in the pulp, any change in the conditions which tends to decrease the flocculation results in improvement in both froth formation and metal recovery. Flotation is easily explained by reference to well known physical phenomena and without the aid of hypothetical, unlikely chem. reactions. The authors describe an expt. from which they conclude that, in the presence of H<sub>2</sub>O, oxidized oil is no better and no worse as a coating agent than unoxidized oil. The persistence of adsorbed air films at the surface of submerged sulfide particles is an assumption for which no proof is offered, and the presence of such films on the surface of particles ground under H<sub>2</sub>O, as is the case with flotation feeds, is even more unlikely. F. W. SMITHER.

**Silverado flotation concentrator.** W. L. ZEIGLER. *Mining Sci. Press* 118, 329 (1919).—A description, with a drawing, of the Zeigler flotation machine installed at the Silverado mine. In this machine, air is introduced into the frothing compartment, in which is a revolving agitator. The froth is said to resemble that made in a pneumatic cell. The ore is minute stringers and grains of galena, gray Cu, and pyrite disseminated through a heavy gang of spathic Fe with quartz, all the Ag being associated with the PbS and gray Cu. The ore is treated at 40-mesh, the ratio of concn. being about 15:1. The Pb shows an extn. of 97%, the Ag 92.2%, with practically all the Cu. F. W. SMITHER.

**Flotation of oxidized ores of lead.** G. L. ALLEN. *Chem. Met. Eng.* 20, 169-75 (1919).—A. discusses the sulfidizing process and its application (cf. Ralston and Allen, *C. A.* 10, 2338). Cerussite and wulfenite sulfidize very readily; minium, anglesite, and pyromorphite slowly tarnish to a dull black in strong Na<sub>2</sub>S solns., but in practice poor recoveries are made on these materials by sulfidizing and flotation. Vanadinite and desloizite are indifferent toward Na<sub>2</sub>S; cerargyrite and AgBr sulfidize readily. Mn compds., especially pyrolusite, basic sulfates of Fe, peroxides of Pb, and Fe<sup>++</sup> salts in soln. interfere with the process. A. describes in detail, with flow sheet, tables of results, etc., mill tests made on the oxidized Pb ore of the Shattuck-Arizona Copper Co., at Bisbee, Ariz. Cerussite, cerargyrite and Au are the valuable minerals; the av. daily chem. analysis of the ore was: Au, 0.054 oz. per ton; Ag, 5.86 oz. per ton; Pb, 11.39; insol., 64.12; Fe, 12.8%. The oils used in flotation were for the most part mixts. of hardwood and coal creosotes with small amts. of pine or pine-tar oils in addition. F. W. SMITHER.

**Fine crushing in ball-mills.** E. W. DAVIS. *Bull. Am. Inst. Mining Eng.* 1919, 111-56.—A detailed account, with tables of results, flow sheet, formulas, curves, etc.

of tests carried out on siliceous rock (about 35%  $\text{Fe}_2\text{O}_3$ , remainder chiefly quartzite and Fe silicates) in an exptl. plant at Duluth, Minn. The matter is presented under the general captions: (1) Operating tests; (2) mechanics of the ball-mill; (3) ball wear; (4) practical application of theoretical conclusions. Largely mathematical.

F. W. SMITHER.

**Milling calculations.** R. S. LEWIS. *Chem. Met. Eng.* 20, 224-33 (1919).—A compilation of formulas useful in detg. extn. of processes, efficiency of machines, d. of solids, solns., and pulps, together with notes on methods of testing and microscopic examn. A bibliography on milling calcns. is appended.

F. W. SMITHER.

**Problems involved in the concentration and utilization of domestic low-grade manganese ore.** E. NEWTON. U. S. Bur. Mines, *War Minerals Inves. Series* 1918, No. 9, 20 pp.; *Bull. Am. Inst. Mining Eng.* 1919, 379-89.—A review and discussion under the general captions: (1) Introduction; (2) Mn deposits in the U. S.; (3) metallurgical requirements of the steel industry; (4) concn. of domestic low-grade Mn ores; (5) factors controlling the possibilities of concn. The author gives estimated cost data applied to 3 Calif. ores.

F. W. SMITHER.

**First year of leaching by the New Cornelia Copper Co.** H. A. TOBELMANN AND J. A. PORTER. *Bull. Am. Inst. Mining Eng.* 1919, 449-95.—A detailed report, with illustrations, tables, flow sheet, discussion, etc., of the operation from May 1, 1917, to May 1, 1918, of a plant at Ajo, Ariz. The ore carried a total Cu content of 1.63%. The process adopted was as follows: (1) mining by steam shovels; (2) crushing to  $\frac{1}{4}$  in.; (3) leaching the crushed ore 8 days by a countercurrent system and upward circulation, using  $\text{H}_2\text{SO}_4$  and such  $\text{Fe}_2(\text{SO}_4)_3$  as is inherent in the process; (4) reduction by  $\text{SO}_2$  gas of the  $\text{Fe}^{+++}$  remaining in the neutral solns. from the leaching tanks; (5) the electrodeposition of part of the Cu from this reduced soln., which is then returned to the leaching soln.; (6) the continuous discharge of such portion of the neutral soln. as is necessary to prevent accumulation of sulfates, other than Cu, to the satn. point; (7) the recovery of the Cu content of such discarded soln. as cement Cu pptd. on Fe; (8) the treatment of a part of this cement Cu with soln. from the electrolytic tank house to the end that the Cu be returned to the circulation and a part of the  $\text{Fe}_2(\text{SO}_4)_3$  be reduced. Cf. C. A. 10, 2682.

F. W. SMITHER.

**Basic refractories for the open-hearth.** J. SPOTTS McDOWELL AND RAYMOND M. HOWE. *Bull. Am. Inst. Mining Eng.* 1919, 291-309.—The 6 materials studied include 2 magnesites, 2 dolomites, and 2 specially treated dolomites, which may be designated, respectively, by the letters A, B, C, D, E, and F. Material A was prepd. from Washington magnesite, ground with  $\text{Fe}_2\text{O}_3$ , and dead-burned. B is a similar product prepd. from Canadian magnesite. C is a prepn. made by coating dolomite granules at high temps. with basic open-hearth slag. D is made by mixing  $\text{Fe}_2\text{O}_3$  and dolomite and calcining at a high temp. E is a relatively impure dolomite that has been calcined. F is a rather pure calcined dolomite. Lab. tests were devised which would to some extent be a measure of the behavior of the different materials in actual practice. The magnesite that was the lower in lime showed less tendency to slake and higher refractoriness, as well as a greater resistance to attack by firebrick and silica brick, and to the action of a corrosive  $\text{Fe}_3\text{P-Fe}_2\text{O}_3$  mixt. than did the high-lime magnesite. With reference to the dolomitic materials, the purest dolomite in general showed the poorest resistance to corrosion, while the materials highest in impurities and lowest in CaO were most resistant to slaking. The magnesites are more resistant than the dolomites or dolomitic preps. to slaking, to the action of the  $\text{Fe}_3\text{P-Fe}_2\text{O}_3$  mixt., of fireclay, and silica. Considering these tests only, the value for refractory purposes of the materials studied may be placed in the same relative order as that first enumerated above.

A. L. FRID.

**Use of manganese alloys in open-hearth practice.** SAMUEL L. HOYT. *Bull. Am. Inst. Mining Eng.* 1919, 279-89.—A presentation of the work done by the War Minerals Investigation, Manganese Section, of the Bureau of Mines, on the use of Mn alloys in open-hearth practice. In the U. S., Mn occurs largely as a low-grade mixt. with Fe and  $\text{SiO}_2$  or with both. The investigation was carried on to det. the extent to which low-grade Mn alloys could properly be substituted for high-grade alloys without materially impairing the quality or quantity of steel produced. As a result of the investigation it is advanced that there are three practices for utilizing our domestic alloys in open-hearth work that commend themselves. They are (1) the use of a molten mixt. of spiegel and pig iron for deoxidation and recarburization, (2) the practice of melting and refining the steel bath so as to secure a comparatively high residual Mn content, about 0.30% Mn, and (3) the use of Mn alloys containing Si. Each of these procedures has been practiced recently at certain plants. With regard to (1), the spiegel mixt. contains from 5 to 11% Mn, 4% C, and the desired amt. of Si, and is added to the ladle during the tapping time in such a way as to get a thorough mixt. of the 2 streams. The advantages of this practice are limited practically to the manuf. of steels running 0.30% C or above. At certain plants a practice of preferential oxidation of C and P has been developed by which the residual Mn is kept comparatively high, about 0.25-0.30%, as compared with 0.10% Mn, for a final C content of 0.10%. The high Mn content of the charge is generally secured by using a high-Mn pig iron, 2 or 3% Mn. The loss of Mn is considerable and would appear to be unavoidable. Data for one heat showed a recovery of 32.6%. In this practice, however, it is possible to use domestic manganiferous iron ore to produce the high-Mn pig, and, assuming the finished steel contains above 0.10% C, to use spiegel at the end of the heat. This practice has certain disadvantages, however, one being that the C content of the bath has to be worked to a lower value than in present practice. Other disadvantages are the high cost of spiegel and the greater time required. The use of Mn-Si alloys will find their first application in the production of forging steel, high-carbon steels and castings where the aim is to produce sound steel and where Si can be used up to 0.20 to 0.35%. The relative merits of the addition of the single alloy as against the addition of ferromanganese plus ferrosilicon can hardly be passed on from the data available. The paper also contains a discussion of the function of Mn in the deoxidation process. It is concluded that in so far as is known it would be impossible to secure a satisfactory substitute, abundant in this country, which would perform all of the functions of Mn.

A. L. FEILD.

**Water-cooled equipment for open-hearth furnaces.** WM. C. COFFIN. *Bull. Am. Inst. Mining Eng.* 1919, 497-515.—A description of modern methods of protecting the refractory linings of open-hearth furnaces by means of water-cooled equipment. Numerous drawings of different applications are given. Decided advantages are claimed for properly designed welded steel plates as material for the construction of practically all shapes used.

A. L. FEILD.

**The deoxidation of steel by ferromanganese.** A. L. FEILD. *J. Ind. Eng. Chem.* 11, 242-4(1919).—The work of previous investigators is cited to show that our present knowledge regarding the true function of ferromanganese, ferrosilicon, and the other deoxidizers is insufficient to explain the observed facts. It is predicted that this problem will be solved only by more extensive measurements of equilibria at high temps. and by the accumulation of a more adequate supply of data concerning the sp. hts. and stability relations of the elements and compds. concerned.

A. L. F.

**The Mondeville-Colombelles Iron and Steel Works.** ANON. *Engineering* 107, 136-7(1919).—A detailed description, with illustrations, of the works near Caen, France. The expected output for the present year is given.

F. W. SMITH.

**Static, dynamic and notch toughness.** SAMUEL L. HOYT. *Bull. Am. Inst. Mining Eng.* 1919, 339-51.—The point of view presented in this paper is that toughness, like hardness, or tensile strength, should be regarded as an independent property of sufficient importance to require quantitative measurement and to be included in specifications. A stress applied to a bar that has a sudden change in cross section, as at a nick or groove (a *notch*), produces a decidedly non-uniform strain distribution at the change of cross-section. This non-uniform strain distribution is referred to as the *notch effect*. Material that is used in the notched condition cannot be differentiated as to whether it is likely to stand up or fail by the tests for toughness which are usually applied. The recognition of the peculiar weakness of certain materials in the notched condition has lead to the development of the impact test on notched bars as a supplement to the usual static and dynamic tests. Even a hasty examination of such machines as locomotives, automobiles, gas engines, etc., reveals an amazingly large no. of notches and materials used in their construction should have a high degree of notch toughness to insure against failure. Microscopic examination on materials, such as splice bars, rear axles and truck steering arms, shows that the trouble was due often to the notch effect. Also in *Iron Age* 103, 545(1919). W. T. H.

**Shimer case-hardening process.** JOSEPH W. RICHARDS. *Bull. Am. Inst. Mining Eng.* 1919, 431-3.—P. W. Shimer has invented a substitute for the bath of melted cyanides which case-hardens with equal or greater facility, gives off no poisonous vapors and costs less. The Shimer liquid bath is obtained by adding fresh  $\text{CaCN}_2$  to a mixt. of easily fusible salts, such as may be obtained by mixing  $\text{NaCl}$ ,  $\text{CaCl}_2$  and  $\text{BaCl}_2$  in equal amts. The method of preparing the bath is explained in detail. W. T. H.

**Effect of temperature, deformation and grain size on the mechanical properties of metals.** ZAY JEFFRIES. *Bull. Am. Inst. Mining Eng.* 1919, 575-8.—The summary is given of a thesis submitted to Harvard Univ. Cf. *C. A.* 13, 220. W. T. H.

**Microstructural features of flaky steel.** HENRY S. RAWDON. *Bull. Am. Inst. Mining Eng.* 1919, 183-201.—In the manuf. of steel defects often occur which are popularly termed "snow flakes," "flakes" or "scabs." These flakes are not usually found in the plain steels but are very common in steel containing Ni or Cr and Ni. The characteristic macro- and micro-structure of flaky steel is described and the conditions are explained under which such defects may be produced. The coarse crystals have the appearance suggesting plastic bodies which have been squeezed together and failed to adhere. The defects originate, probably, in the ingot where they have the appearance of intercryst. shrinkage cracks. They occur in the cast metal along with slag inclusions in the angles between the branches of the dendritic crystals. They persist throughout the history of the forging into the finished form as discontinuities in the metal, often associated with slag films which have resulted from the working down of slag inclusions. Though they are usually associated with dirty steel, they are not always present in such steel. W. T. H.

**Prevention of columnar crystallization by rotation during solidification.** HENRY M. HOWE AND E. C. GROESBECK. *Bull. Am. Inst. Mining Eng.* 1919, 361-5.—Continuously varying rotation during solidification keeps the metal sweeping past the walls where it is solidifying. Tchernoff, before 1880, proposed such treatment of ingots solidifying in a mold and Webb cast locomotive driving wheels in this manner. Rxpts. with a hot soln. of ammonium alum resulted in larger crystals being formed with quiescent solidification than with rotating solidification and similarly, with a mixt. of Zn and 5% type metal, columnar crystals were obtained to a greater degree when the molten metal was allowed to cool quietly than when the mold was rotated. W. T. H.



**Flaky and woody fractures in nickel steel gun forgings.** CHARLES Y. CLAYTON, FRANCIS B. FOLLY AND FRANCIS B. LANEY. *Bull. Am. Inst. Mining Eng.* 1919, 203-37.—The most characteristic feature of flaky steel under the microscope is the lack of complete grain refinement. The woody texture and flakes appear more prominently when the steel is broken in a direction transverse to that of elongation in forging. When flakes appear there is usually evidence of overheating, such as shown by Widmannstättian structure in the sorbite grains and the so-called *spiny* ferrite bands. The microscopic appearance indicates that the flakes are caused by the rupture of small areas irregularly distributed through the metal so differing from the other metal that the rupture occurs both in the ferrite and through the sorbite in the Widmannstättian plates. Probably some non-ferrous metal is segregated in the ferrite, thus making it more brittle than the surrounding metal. Chem. tests indicate that the flake areas are higher in P and C than the normal metal. When flakes are present small cracks develop at right angles to the direction of stress in the tensile test. The bars show loss of ductility and somewhat lessened strength. As regards the woody fracture, it is probably caused by the condition of the steel with respect to the original dendritic structure. By working the original dendrites in parallel lines by forging a laminated or woody fiber is produced. The greater the amt. of work applied, the longer and thinner do these longitudinal lines become and there results a low transverse ductility. When transverse strains are to be withstood, care should be taken not to subject a Ni-steel to much hot work.

W. T. H.

**Davidson process of casting formed tools.** J. E. JOHNSON, JR. *Bull. Am. Inst. Mining Eng.* 1919, 353-60.

W. T. H.

**Effect of cold working and rest on the resistance of steel to fatigue under reversed stress.** H. F. MOORE AND W. J. PUTNAM. *Bull. Am. Inst. Mining Eng.* 1919, 391-404.—It has been known for some time that the elastic limit, the yield point and the ultimate strength of steel may be raised by cold working if a period of rest ensues after the cold work. There are but few test data on the fatigue strength of cold-worked steel under repeated stresses and tests here described were undertaken to det. whether increased fatigue strength accompanied increased dead-load or static strength due to cold-working of steel. The tests, which are described at length and summarized in plots and tables, indicate than an increase in the strength of medium-C steel due to cold working does not necessarily indicate increased resistance to fatigue under repeated stress. No marked benefit of a short period of rest on the fatigue strength could be detected.

W. T. H.

**Molybdenum-steel vs. gun erosion.** MASATOSI ÔKÔCHI, MASAICHI MAJIMA AND NAOSHI SATO. *J. Coll. Eng. Tokyo Imp. Univ.* 9, 153-95(1918).—An investigation of the physical properties of Mo steel and other special steels used for gun barrels, *vis.*, ordinary gun steel, Ni-steel, Ni-Mo-steel, and W-steel. *Modulus of elasticity:* Av. value of  $E$  for 7 different samples of Mo-steel (containing from 0.32 to 1.58% Mo) was 22,178 kg./mm<sup>2</sup>., about 1.4% greater than that found for ordinary gun steel. *Modulus of rigidity:*  $R$ , modulus of rigidity, for Mo-steel containing 1.05% Mo is equal to 8,670 kg./mm<sup>2</sup>., from which, with value of  $E$ , Poisson's const. is calcd. to be 0.275. *Hardness:* This was measured with the Brinell machine on unquenched specimens and on specimens quenched at various temp. up to 900°. A rapid increase of hardness was observed in range 600-750°. No effect was noticed below 600°. Specimens annealed at 900°, slowly cooled to a lower temp., and then quenched, showed an increase in hardness at much lower temps. than those quenched in the ordinary way. The same hardness, therefore, is obtained with less stress due to temp. differences, if the steel is quenched at  $\gamma$  state whatever its temp. may be. *Thermal dilatation:* A contraction, due to the change from the  $\alpha$  to  $\gamma$  state, occurs in Mo, W, and gun steel at about 750°.

while in Ni and Ni-Mo steel it appears at about  $700^{\circ}$  or slightly lower, and in both cases continues over a range of from  $30$  to  $80^{\circ}$ , after which expansion again takes place. The rate of expansion in the  $\gamma$  state is more rapid than that in the  $\alpha$  state, so that the coeff. of expansion for the latter lies between  $1.0 \times 10^{-6}$  and  $1.7 \times 10^{-6}$ , while for the former it is between  $2.0 \times 10^{-6}$  to  $2.2 \times 10^{-6}$ . By gradually cooling the specimen after the  $\gamma$  state is reached, it contracts as the temp. decreases, but a sudden expansion is observed at the  $A_1$  transformation. The temp. difference between  $A_c$  and  $A_r$  transformations is in the case of Mo-steel equal to  $47^{\circ}$ , and to  $320^{\circ}$  for Ni-Mo steel. The expansion of quenched specimens was also studied. *Thermal conductivity:* For Mo-steels, the value of  $k$ , in g. cal./cm<sup>2</sup>., varies for a temp. of  $50^{\circ}$  between  $0.081$  and  $0.129$ , depending upon the compn. For ordinary gun-steel,  $k = 0.127$ . *Conclusions:* The data obtained are not sufficient to det. whether Mo steel is preferable as gun material or not. When compared with W- and Ni-steels it produces a steel of higher thermal cond., about equal to that of C steel. Low thermal cond. may be one of the reasons Ni steel is more easily eroded than C steel. There is no satisfactory theory for the formation of numerous fine cracks on the surface of a gun bore when many rounds have been fired. Since the surface is heated by firing to a temp. higher than the  $A_1$  transformation, and since a sudden contraction will be produced on the surface at the critical temp. while the other part of the wall continues to expand continuously, the rupture of the thin layer may be expected if the shearing and tensile stresses on the thin layer and the circumferential stress due to the internal pressure produced by combustion are much greater than the temp. stress where the inner surface is hotter than the external and consequently subjected to compressive stress. If the above is true, the coeff. of contraction of the material at  $A_1$  transformation must be one of the most important factors in erosion. This is in accord with the observation that erosion increases with the C content, since it has been observed by Honda that the mean coeff. of contraction at the critical temp. increases with the carbon content of the steel.

A. L. FIELD.

**Magnetic properties of iron alloys.** GUMMICH. *Elektrotechnik und Maschinenbau* Sept. 1, 1918; *J. Ind. Eng. Chem.* 11, 247(1919).—The materials used in the investigation consisted of pure electrolytic Fe and four series of alloys with increasing C content (up to 1.8%). The d. and sp. resistance vary with the percentage of added material. It would seem that the addition of Si or Al does not improve to any extent the magnetic properties of Fe, and any benefit derived by their presence is due to secondary causes as O is removed and the effect of the C is somewhat neutralized. Eddy-current losses are reduced by the addition of Si and Al. Results are also given showing the effect of the added materials on the coercive force and from them it would appear that good permanent magnets can be produced by adding W, Cr or Mo to Fe.

E. J. C.

**Path of rupture in steel fusion welds.** S. W. MILLER. *Bull. Am. Inst. Mining Eng.* 1919, 311-38; cf. *C. A.* 12, 671.—The existence of needles or plates (possibly of Fe nitride) at the grain boundaries in welds suggests that these may be the cause of brittleness in electric welds. Recently similar needles have been discovered in oxy-acetylene welds. In this case, however, they have not been found in the body of the welds and have not had any noticeable effect upon the strength of the weld. Heavy oxy-acetylene welds are, however, often very brittle. A small testing machine was made in which a specimen could be bent, after being polished and etched, and examined under the microscope. The results obtained are best understood by inspection of the 82 photomicrographs which are reproduced. The first evidence of strain in any weld takes place wherever there are visible defects in the weld, such as are caused by films of oxide around the grains of metal. The structure is usually more columnar in electric

welds than in gas welds. Probably the slower rate of cooling of gas welds makes the grains more nearly equiaxed. Metals like Mn, or V, which tend to preserve the pearlitic structure in a gas weld, seem to produce more columnar grains. If there are no defects in the welds, the first appearance of distortion varies with the kind of weld and kind of material used. In oxy-acetylene welds made with pure Fe without Mn or V, slip bands appear in the grains first. In all elec. welds and in gas welds with material containing considerable C and especially if Mn or V are present sufficient to preserve a pearlitic structure, the path of rupture is along the grain boundaries. In all brittle welds, the structure is more or less columnar. They all contain pearlite, cementite or possibly Fe nitride or oxide. To account for the brittleness of any weld, it seems necessary to assume that it is caused by films of material at the grain boundaries. W. T. H.

**Manganese bronze.** P. E. MCKINNEY. *Bull. Am. Inst. Mining Eng.* 1919, 421-5. —In marine construction, mining machinery, etc., where corrosion is likely to be a serious problem, Mn-bronze has been much used. The purpose of this paper is to suggest possibilities with regard to the more economical manufacture of this alloy. Results of about 3 yrs. of operation have shown that it is not necessary to use strictly high grade virgin materials to obtain a good bronze. W. T. H.

**Volatilization of cuprous chloride on melting copper containing chlorine.** S. SKOWRONSKI AND K. W. MCCOMAS. *Bull. Am. Inst. Mining Eng.* 1919, 169-79. —Expts. in which Cu containing Cl was melted under CO<sub>2</sub>, under air and under furnace gases prove that under present Cu refining practice any Cu<sub>2</sub>Cl<sub>2</sub> present in or on the cathode can be regarded as completely volatilized on melting. This may result in serious metallurgical loss of Cu. W. T. H.

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**Eliminating phosphorus and sulfur in electric ferromanganese furnaces (LONERGAN) 4.**

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**WILLIS, PRIOR F.: A Practical Manual of Oxy-Acetylene Welding and Cutting, with a Treatise on Acetylene and Oxygen.** 3rd Ed. St. Louis, Mo. 210 pp. \$0.75.

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**Refining nickel-copper mat.** C. LANGER and O. LANGER. U. S. 1,291,030, Jan. 14. Roasted Ni-Cu mat is treated with dil. H<sub>2</sub>SO<sub>4</sub> to dissolve out the greater proportion of the Cu oxide and the residue is then treated with strong H<sub>2</sub>SO<sub>4</sub> at a temp. of about 150° to convert oxides into sulfates, the latter are dissolved in H<sub>2</sub>O and the Cu is pptd. by use of finely divided metallic Ni. Cf. C. A. 12, 37.

**Vertical zinc smelting furnace.** F. FIECHTL. U. S. 1,291,643, Jan. 14.

**Reclaiming metal scrap.** E. R. SUTCLIFFE. U. S. 1,291,672, Jan. 14. Metal scrap (such as shavings, borings, turnings, sawdust or the like) is intimately mixed while wet with a flux such as borax, soda or potash, so that the particles are subjected to a rubbing action and are covered with a layer of the flux, and the material is then briquetted under heavy pressure to prep. it for melting.

**Iron and steel manufacture.** ARMSTRONG, W. G. WHITWORTH & Co., F. B. TREVELYAN and W. C. ROWDEN. Brit. 121,785, Dec. 29, 1917. In the production of steel from scrap, with or without pig Fe, the C necessary to enable the charge to boil in the required manner without burning is introduced into the open-hearth or other furnace used in a dense or difficultly combustible form, such as charcoal briquets. Ore may be added to the charge if necessary.

**Hardening iron or steel.** J. W. BOYD. Holl. 2,643, Oct. 15, 1918. Fe is placed, cold, in molten KCN contg. powdered C in suspension, and the bath is heated to the desired temp. The metal is then plunged into a suitable liquid to cool.

**Manganese steel.** W. G. NICHOLS. U. S. 1,291,655, Jan. 14. Mn steel is prepd. by sepg. slag from blown metal, weighing the metal while it is still at a temp. of about 1650° and then adding to it a sufficient quantity of a 20% Mn steel alloy at a temp. of about 1300° to produce a steel having a content of 11-14% Mn and of proper temp. for pouring, and then pouring the metal into molds.

**Manganese steel.** W. G. NICHOLS. U. S. 1,291,656, Jan. 14. In recovering Mn steel from scrap, the metal is heated throughout the mass under treatment to a temp. below the oxidizing point of Mn (preferably below 370°), the temp. of the bath is gradually increased to about 650° and thereafter to above 1300°, the several stages of temp. being developed throughout the bath without materially increasing the temp. of any portion of the material above that of the surrounding material. The bath is maintained at about the m. p. until the metal is needed and the temp. is then increased to render the metal more highly fluid immediately preceding the tapping of the metal, additional Mn is added, and the metal is then tapped.

**Mending fissures in castings.** W. F. SINGER. U. S. 1,291,207, Jan. 14. A compn. for closing fissures in metal castings is formed by mixing molten S with two-thirds its weight of graphite.

**Iron alloy.** J. R. SPEER. U. S. 1,291,220, Jan. 14. An alloy which is readily annealed and strengthened by heat treatment and which is adapted for making chilled roll castings is formed by fusing together approx. equal amts. of charcoal Fe and low-C steel, together with Cr 0.5-2% and Ni 0.25-1%, and casting into the desired shape.

**Magnetizable alloy.** L. W. CHUBB. U. S. 1,291,408, Jan. 14. A magnetizable alloy, suitable for use in making parts of elec. app. for use with inductions of 16,000 gausses or greater, is formed of Fe 97-98% and Ni 3-2%. The alloy has a much greater magnetic permeability than ordinary Fe or steel.

**Acid-proof alloys.** C. ROSSI. Brit. 121,730, Dec. 13, 1918. Acid-proof alloys of Fe and Si contg. not less than 13-15% or 20-21% of Si are made in a substantially pure state preferably in an elec. furnace. Pig Fe may be melted with ferrosilicon and the impurities allowed to crystallize out of the molten mass, and a small amt. of a flux such as FeS may be added; or Fe or steel scrap may be melted with ferrosilicon, Fe<sub>2</sub>O<sub>3</sub> being added when necessary to remove the C. The alloys may be used for making vessels for chem. manufs., and as anodes in electrolytic processes.

**Cleaning metal and protecting it from rust.** H. E. FINLAY and F. L. FANGBONER. U. S. 1,290,952, Jan. 14. Articles of metal which are to be cleaned and protected from rust are pickled with a hot soln. of HCl and HNO<sub>3</sub>, then immersed in a cold KCN soln. of 30° Bé., washed in Na<sub>2</sub>CO<sub>3</sub> and immersed in oil heated to above 100°.

**"Rust-proofing" iron and steel.** W. H. ALLEN. U. S. 1,291,352, Jan. 14. A soln. for rendering Fe and steel resistant to rust is formed of H<sub>2</sub>O 100, H<sub>3</sub>PO<sub>4</sub> 0.5, MnO<sub>2</sub> 0.4, and Zn 0.004-0.04 part. Any oxidizing salt may replace MnO<sub>2</sub>.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Action of acylamino acid chlorides on sodiomalonic ester. V. S. GABRIEL AND BRUNO LOWENBERG. Univ. Berlin. Ber. 51, 1493-500(1918); cf. Immendorfer, C. A. 9, 1913.—*Dimethyl o-phthalimidobenzoymalonate* (a), C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>COCH(CO<sub>2</sub>Me)<sub>2</sub>, unlike the esters C<sub>6</sub>H<sub>4</sub>(CO)<sub>2</sub>NCR<sub>2</sub>COCH(CO<sub>2</sub>Me)<sub>2</sub> studied in the previous papers and from which it differs in structure only in having an *o*-C<sub>6</sub>H<sub>4</sub> instead of the CR<sub>2</sub> grouping, is not rearranged but is decompd. by NaORt; does not react

with Na in the expected way (formation of a 6-ring compd.,  $\text{MeO}_2\text{CC}_6\text{H}_4\text{CO-N.CO.CH}(\text{CO}_2\text{Me}).\text{CO.C}_6\text{H}_4$ ); and its Na salt with MeI gives an *O*- instead of a *C*-Me

deriv. *o*-Phthalimidobenzoyl chloride, from the acid and  $\text{PCl}_5$  heated until liquefied and freed from  $\text{POCl}_3$  *in vacuo* at  $100^\circ$ , columns from  $\text{C}_6\text{H}_6$ , m.  $152-3^\circ$ ; 28.5 g. in 90 cc. of hot  $\text{C}_6\text{H}_6$  are added to a soln. of 4.6 g. Na powder and 37 cc.  $\text{CH}_3(\text{CO}_2\text{Me})_2$  in 200 cc.  $\text{C}_6\text{H}_6$ ; after several hrs. the resulting Na salt is filtered off, dissolved and pptd. with  $\text{CO}_2$ , giving 12 g. (a), and HCl ppts. a further 7 g. of less pure (a); the first crop deposits from 45 cc.  $\text{Me}_2\text{CO}$  7 g. of pure (a), short, flat prisms, m.  $159-61^\circ$ , gives a cherry-red color with alc.  $\text{FeCl}_3$ . Boiled 0.5 hr. with HI, (a) gives MeI,  $\text{CO}_2$  and *o*-aminoacetophenone hydriodide, decomp.  $150^\circ$ . If 2 g. (a) in 15 cc. MeOH are treated with 3 cc. of 4% NaOMe the resulting yellow soln. soon deposits delicate yellowish white needles of the sodium salt, sol. in  $\text{H}_2\text{O}$  with neutral reaction, which when allowed to stand under the mother liquors several hrs. or more quickly when warmed form a colorless soln.; this when evapd. to dryness on the  $\text{H}_2\text{O}$  bath leaves a resinous residue, about 0.5 g. of which remains undissolved when rubbed with 100 cc.  $\text{H}_2\text{O}$  and consists of methyl *o*-phthalimidobenzoate, rhombohedrons from much MeOH, m.  $160-2^\circ$ , insol. in acids and alkalis, also obtained by warming 2 g.  $\text{C}_6\text{H}_4(\text{CO})_2\text{NC}_6\text{H}_4\text{COCl}$  with 5 cc. MeOH and 4.5 cc. of 4% NaOMe. The  $\text{H}_2\text{O}$ -sol. portion of the product seps. from a little MeOH in flat leaves, m.  $145-6^\circ$ , sol. in alkalis, repptd. by acids, gives no red color with  $\text{FeCl}_3$ ; it is monomethyl phthaloylanthrinate,  $\text{HO}_2\text{CC}_6\text{H}_4\text{CONHC}_6\text{H}_4\text{CO}_2\text{Me}$ , also obtained by cautiously fusing  $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$  with  $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{Me}$  and crystg. from MeOH. The Na salt of (a) heated 1 hr. at  $100^\circ$  with MeI in  $\text{Me}_2\text{CO}$  gives the compound  $\text{C}_6\text{H}_4(\text{CO})_2\text{NC}_6\text{H}_4\text{C}(\text{OMe})\text{:C}(\text{CO}_2\text{Et})_2$ , flat columns and rhombohedrons from MeOH, m.  $148-9^\circ$ , gives no red color with  $\text{FeCl}_3$ ; boiled several hrs. with HCl or HBr it gives  $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  and  $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ , whereas when heated with HI with addition of PhI from time to time to destroy the brown color of liberated I it finally yields an almost colorless soln. which is gently boiled 2 hrs. more; MeI and  $\text{CO}_2$  are evolved, the HI is distd. off *in vacuo* and the residue is crystd. from  $\text{H}_2\text{O}$  and 50% AcOH; it seps. in flat needles and 6-sided tables (1.2 g.), m.  $248^\circ$  (decompn.), sol. in alkalis, repptd. by acids, titrates as a diacidic acid with litmus, forms a light blue copper salt,  $\text{C}_{17}\text{H}_{11}\text{O}_4\text{NCu}$ ; it is probably  $\text{HO}_2\text{CC}_6\text{H}_4\text{CH}(\text{CO}_2\text{H}).\text{CO.C}_6\text{H}_4\text{NH}$  (b),

for when heated 3 hrs. with fuming HCl at  $180^\circ$  it gives  $\text{CO}_2$ ,  $\text{PhNH}_2$  and  $\text{C}_6\text{H}_4\text{CO.O.CHCH}_2\text{CO}_2\text{H}$ , m.  $151^\circ$ . Diethyl *o*-phthalimidobenzoylmalonate, prisms,

sinters  $94^\circ$ , m.  $105-7^\circ$ , gives a cherry-red color with  $\text{FeCl}_3$ , converted by HI into  $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$  and *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{Ac}$  and by NaOMe into ethyl phthalimidobenzoate, prisms, m.  $108-9^\circ$ . Ethyl phthaloylanthrinate, broad needles, m.  $114-6^\circ$ , sol. in alkalis. Diethyl [o-phthalimidobenzoyl]ethylmalonate,  $\text{C}_6\text{H}_4(\text{CO})_2\text{NC}_6\text{H}_4\text{C}(\text{OEt})\text{:C}(\text{CO}_2\text{Et})_2$ , columns, m.  $89-90^\circ$ . Diethyl [o-phthalimidobenzoyl]methylmalonate, short, rhombohedral prisms, m.  $104-6^\circ$ , converted into (b) by HI.

CHAS. A. ROUILLER.

Some quinoline derivatives. S. GABRIEL. Univ. Berlin. Ber. 51, 1500-15 (1918); cf. preceding abstr.—Ethyl [o-phthalimidobenzoyl]cyanacetate (a), obtained in 68% yield by treating 11 g.  $\text{NCCH}_2\text{CO}_2\text{Et}$  in 60 cc.  $\text{C}_6\text{H}_6$  with 1.6 g. Na, shaking after 3 hrs. with 9.3 g.  $\text{C}_6\text{H}_4(\text{CO})_2\text{NC}_6\text{H}_4\text{COCl}$  in 30 cc.  $\text{C}_6\text{H}_6$  for 0.5 hr., letting stand overnight, shaking with much  $\text{H}_2\text{O}$  and pptg. from the aq. layer with HCl, seps. from alc. in flat needles, m.  $178-9^\circ$ , gives a brown-red color with alc.  $\text{FeCl}_3$ , sol. in  $\text{NH}_4\text{OH}$ , alkalis and carbonates; ammonium salt, yellow prisms; the silver salt,  $\text{C}_{20}\text{H}_{14}\text{O}_4\text{N}_2\text{Ag}$ , shaken in  $\text{Me}_2\text{CO}$  suspension at  $100^\circ$  1.5 hrs. with MeI, gives a methyl derivative,  $\text{C}_{22}\text{H}_{16}\text{O}_4\text{N}_2$ , columns or cryst. granules from alc., m.  $173-4^\circ$ , gives no color with alc.  $\text{FeCl}_3$ ; it is probably the *O*-Me compd.,  $\text{C}_6\text{H}_4(\text{CO})_2\text{NC}_6\text{H}_4\text{C}(\text{OMe})\text{:C}(\text{CN})\text{CO}_2\text{Et}$ ,

for with boiling HI it yields the same product  $C_8H_6ON_2$  (See (d) below) as is obtained from (a) itself. (a) dissolves in 1 mol. cold *N* alkali with neutral reaction; if a 2nd mol. of alkali is added the soln. becomes neutral slowly in the cold, rapidly on warming and HCl now ppts. an acid,  $HO_2CC_6H_4NHC_6H_4COCH(CN)CO_2Et$ , short microprisms or crusts from alc., sinters above  $255^\circ$ , m.  $263-5^\circ$  (decompn.), titrates as a dibasic acid, gives a cherry-red color with  $FeCl_3$ ; *disilver salt*. If the acid is quickly dissolved in 10 parts hot AcOH, the yellow soln. soon deposits, even while still hot, needles of *2-cyano-2,4-dihydroxyquinoline* (b),  $C_8H_4N:C(OH).C(CN):COH$ , sinters about  $170^\circ$ ,

m. about  $300^\circ$ , gives a red-yellow color with alc.  $FeCl_3$ , sol. in  $NH_4OH$ , alkalies and carbonates, titrates as a monobasic acid, converted by boiling 1 hr. with 8 parts HI and a little  $PH_4I$  into *2,4-dihydroxyquinoline*. *Silver salt*: Boiled 1.5 hrs. with 14 g.  $PCl_5$  and 30 cc.  $POCl_3$ , 6 g. (b) gives 6.5-7.0 g. *3-Cyano-2,4-dichloroquinoline* (c), needles from alc., m.  $168-9^\circ$ ; if the boiling is continued only 0.5 hr., the product, after removal of the  $POCl_3$  in *vacuo*, yields to KOH *3-cyano-2(or 4)-hydroxy-4(or 2)-chloroquinoline*, yellowish, flat needles from AcOH, does not m.  $280^\circ$ , sol. in dil. KOH, seps. as the yellowish K salt from more concd. KOH. When 3 g. (c) is boiled 6 hrs. with 1.5 g. red P and 24 cc. HI (b.  $127^\circ$ ) it gives 1.2 g. *4-hydroxyquinoline-3-carboxylic* (kynurenic) acid, m.  $265^\circ$  (decompn.). From 8 g. (a) boiled 0.5 hr. with 32 cc. HI is obtained 12 g. crystals which, when gently warmed with 100 cc.  $H_2O$ , leaves undissolved 1.5 g.  $C_6H_4(CO_2H)_2$ , while the soln., treated with a slight excess of soda and concd., yields *2-amino-4-hydroxyquinoline* (d), long needles with 1 mol. solvent from  $H_2O$ , anhydrous rhombohedrons from alc., sinters about  $285^\circ$ , m.  $303-4^\circ$ , easily sol. in HCl and in caustic alkalies, forms a cryst. chloroplatinate and chloroaurate; *hydrobromide*, hair-like needles. The mother liquors yield some *2,4-dihydroxyquinoline* (e). The same decompn. of (a) is effected, although more slowly, with boiling HBr instead of HI; in this case (e) is formed in somewhat larger amt. (e) can be obtained in 90% yield much more easily and quickly from *o*- $O_2NC_6H_4COCH(CO_2Et)_2$  (f) with HI than with Sn and HCl (Bischoff, *Beilstein*, IV, 286); 45 g. (f) are added in small portions to 15 g. red P in 180 cc. HI (d. 1.70), then boiled 0.5 hr., cooled, dild. with  $H_2O$ , filtered, treated with hot soda and pptd. with HCl; 3 g. suspended in 20 cc. AcOH and heated on the  $H_2O$  bath with 5 cc.  $HNO_3$  (d. 1.30) yields 6.3 g. *2,4-dihydroxy-3-nitroquinoline* (g), long, flat, S-yellow prisms from AcOH, changes color about  $216-8^\circ$ , decomp. about  $225^\circ$ , sol. in  $NH_4OH$  and alkalies, takes up 1 mol.  $NH_3$ ; *silver salt*, lemon-yellow needles, deflagrates on heating. Heated 2 hrs. on the  $H_2O$  bath with  $POCl_3$  it gives *2,4-dichloro-4-nitroquinoline*, needles from alc., m.  $102^\circ$ , volatile with steam, violently attacks the mucous membranes, produces painful burns on the skin, reduced by 30% HCl and Sn sponge to *3-aminoquinoline*, m.  $84-5^\circ$ . (d) can be conveniently prepd. by slowly adding *o*- $O_2NC_6H_4COCl$  (from 12.5 g. of the acid and 16 g.  $PCl_5$ ) in 30 cc.  $Et_2O$  to the magma obtained from 3.5 g. Na in 50 cc. alc. and 8.5 cc.  $NCCH_3CO_2Et$  in 30 cc.  $Et_2O$ , shaking after 2 hrs. with  $H_2O$  and satg. the aq. layer with HCl; the resulting *ethyl [o-nitrobenzoyl]cyanoacetate* (12 g.), needles from alc., m.  $91^\circ$ , gives a yellow-red color with alc.  $FeCl_3$ ; 5 g. slowly added to 20 cc. hot HI and 2 g. red P, boiled 0.5 hr., cooled, filtered, dissolved in warm  $H_2O$ , decolorized with  $SO_2$ , filtered and treated with excess of  $NH_4OH$ , gives 1.8 g. (d). In dil. HCl with somewhat more than the calcd. amt. of nitrate it yields the *iminoquinisatoxime*,  $C_8H_4NHC(:NH).C(:NOH).CO$  or  $C_8H_4N:C(NH_2).C(:NOH).CO$ , liver-colored micro-

cryst. spheres, red-brown to gray-yellow when dry, sol. in KOH with blood-red color, depositing the cinnabar-red *potassium salt* from excess of KOH; the  $CO_2$  of the air repts. the free oxime from the alk. soln. Warm concd. HCl also dissolves the oxime with blood-red color and on cooling deposits the *hydrochloride* in orange-yellow needles;

hot  $\text{HNO}_3$  (d. 1.34) gives (g); Sn sponge and 20% HCl yield the *hydrochloride*, crystals with 1  $\text{H}_2\text{O}$ , of 2(or 3)-*amino-3,4*(or 2,4)-*dihydroxyquinoline*, silky needles with 1  $\text{H}_2\text{O}$ , does not m.  $300^\circ$ , sol. in alkalis; finally the oxime, rubbed with HI (b.  $127^\circ$ ) and decolorized with  $\text{PH}_4\text{I}$ , gives 2,3-*diamino-4-hydroxyquinoline*, pptd. by  $\text{NH}_4\text{OH}$  in long, flattened needles, sol. only in traces in  $\text{H}_2\text{O}$ , the soln. reducing  $\text{AgNO}_3$ , sol. in alkalis, is dibasic, fuming HCl pptg. from the soln. in dil. HCl a *dihydrochloride* in needles. Quiniasatoxime (Baeyer and Homolka, *Beilstein*, IV, 286) with Sn sponge and cold 20% HCl gives the *hydrochloride*, needles with 1  $\text{H}_2\text{O}$ , does not m.  $285^\circ$ , of 2,4-*dihydroxy-3-aminoquinoline*, pptd. by  $\text{KOAc}$  in micro-needles, does not m.  $280^\circ$ , darkens at  $100^\circ$  or on long standing in a desiccator, dissolves very slightly in  $\text{H}_2\text{O}$ , the soln. reducing  $\text{AgNO}_3$  on warming. It is easily sol. in  $\text{NH}_4\text{OH}$ , the soln. soon becoming blue and covered with a Cu-colored film. The same base is obtained as the *hydriodide*, needles with 1  $\text{H}_2\text{O}$ , when the oxime is stirred with HI and decolorized with  $\text{PH}_4\text{I}$ . The HCl and HI salts are partially hydrolyzed by  $\text{H}_2\text{O}$ . The base is also obtained from (g) by boiling with Sn and HCl. Its *acetyl derivative*, from the HCl salt heated on the  $\text{H}_2\text{O}$  bath with  $\text{KOAc}$  and  $\text{Ac}_2\text{O}$ , decomps. above  $200^\circ$ , does not m.  $285^\circ$ . CHAS. A. ROUILLER.

**Mono- and dichlorophenanthrenes.** HÅKAN SANDQVIST AND A. HAGELIN. Univ. Upsala. *Ber.* 51, 1515-26(1918).—When 100 g. phenanthrene in 130 cc.  $\text{CS}_2$  or  $\text{CCl}_4$  is treated at about  $0^\circ$  during the course of 2-3 hrs. with 35-60 g. Cl in  $\text{CS}_2$  or  $\text{CCl}_4$  and allowed to stand overnight, there seps. about 0.1 g. of a yellow, felted mass, apparently a trichloroanthracene, m.  $373^\circ$  (cor.) and then sublimes in light yellow needles. The filtrate on evapn. leaves an oily residue solidifying on cooling to a mixt. of 2 kinds of crystals, sepd. by means of alc. into difficultly sol., long, light yellow needles of 9,10-dichloroanthracene, m.  $208-9^\circ$  (usually about  $3^\circ$ ), and about 10 g. 9,10-phenanthrene *dichloride* (a). The residual oil on distn. evolves HCl between  $100-75^\circ$  and yields unchanged phenanthrene ( $330-40^\circ$ ), 10-chlorophenanthrene (b) ( $350-60^\circ$ ) and a little anthracene (above  $360^\circ$ ); total distillate, about 50 g. Much tar remains behind. (a) decomps. markedly, even at room temp., in a few days, also in alc. soln. The presence of (b) on the solid crystals of (a) catalyzes their decompn. considerably, so that it is difficult to det. the exact m. p. of (a), which is  $161^\circ$  (cor.) (evolution of HCl and formation of (b)). (b), obtained in 40-5 g. yield from 100 g. phenanthrene by heating the mixt. of (a) and (b) 1 hr. at  $150-75^\circ$ , m.  $53-3.5^\circ$ , b<sub>mm</sub>  $370^\circ$  (cor.),  $d_{44}^{25}$  1.2310,  $d_{46}^{25}$  1.2163, seps. from AcOH in long, fine needles, gives phenanthrenequinone in good yield on oxidation; *picrate*, fiery yellow, prismatic needles from alc., m.  $115^\circ$  (cor.). In attempting to convert the phenanthrene obtained in the distillate into (b) by treating it in  $\text{CS}_2$  with dry Cl there was obtained 9,10-dichlorophenanthrene, needles from alc., m.  $160-0.5^\circ$ , also prepd. in 75% yield by treating (b) in cold  $\text{CS}_2$  or  $\text{CCl}_4$  with Cl, partially oxidized in AcOH by a large excess of  $\text{CrO}_3$  to phenanthrenequinone, forms no *picrate* in alc., converted by  $\text{H}_2\text{SO}_4$  into a sulfonic acid showing the same remarkable phenomena of anisotropy and viscosity as other halogen-substituted sulfonic acids of phenanthrene. 1-10-Chlorophenanthrene-3(or 6)-sulfonic acid (c) (C. A. 12, 807) is obtained as the K salt in 80-90% yield by treating 30 g. (b), fused on the  $\text{H}_2\text{O}$  bath, with 25 g. of warm 96-7%  $\text{H}_2\text{SO}_4$ , heating 30-45 min. on the  $\text{H}_2\text{O}$  bath, then adding 10 g. of warm acid, continuing the heating until the mixt. becomes solid, dissolving in 1-2 l.  $\text{H}_2\text{O}$ , filtering from unchanged (b) and neutralizing hot with KOH. With  $\text{PCl}_5$  over a free flame the chloride of (c) gives 1-10,3(or 6)-*dichlorophenanthrene*, needles from alc., m.  $125-5.5^\circ$  (cor.), identical with the compd. obtained as by-product in the prepn. of 3-chlorophenanthrene (C. A. 4, 762), converted by  $\text{CrO}_3$  in boiling AcOH into 3-chlorophenanthrenequinone, orange-yellow needles from AcOH, m.  $261^\circ$  (cor.), insol. in  $\text{NaHSO}_4$ , and yielding with  $\text{NH}_4\text{OH.HCl}$  in boiling alc. a 9(or 10)-*oxime*, yellow needles from alc., m.  $204^\circ$  (cor.) (decompn.). Potassium 11-10-chlorophenanthrene-3(or 6)-sulfonate,

needles, is prepd. by treating 10 g. K phenanthrene-3-sulfonate (*d*) in 600 cc. H<sub>2</sub>O at 50° with 1000-1200 cc. satd. Cl water in the course of several hrs. and concg. (yield, 22 g. crude salt from 85 g. (*d*)). The free acid is prepd. from 0.5 g. of the chloride (see below) by heating with 2 cc. of H<sub>2</sub>O at 140-50° for 15 min.; on cooling the soln. becomes extremely viscous and turbid and under the polarizing microscope appears cryst., of the same type as the Br analog; the soln. becomes clear at 35°. The HCl escapes quite easily on the H<sub>2</sub>O bath. The acid, after standing in the air, m. 150° (vigorous gas evolution), loses 8.4% H<sub>2</sub>O over H<sub>2</sub>SO<sub>4</sub> and 4.7% more at 115° (13.1% corresponds to about 2.5 mols. H<sub>2</sub>O), and then m. 207°. A dil. soln. of the acid free from HCl is not strikingly viscous but becomes so when treated with a strong acid (HNO<sub>3</sub> or HCl), and even when free from HCl it forms a cryst. liquid in sufficiently concd. soln. The chloride, from the K salt and PCl<sub>5</sub>, seps. from C<sub>6</sub>H<sub>6</sub> as a gray powder of irregular leaflets, m. 171°, which, heated over a free flame with PCl<sub>5</sub>, gives *II-10,3* (or *6*)-dichlorophenanthrene, needles from alc., m. 113°, oxidized by CrO<sub>3</sub>-AcOH to 3-chlorophenanthrenequinone. In the prepn of the di-Cl compd. is also formed a more difficultly sol. substance, probably 3,9,10-trichlorophenanthrene, m. 109-9.5°.

CHAS. A. ROUITLER.

**Alteration of iodoform in direct sunlight alone and in solution.** E. COMANDUCCI AND G. MEDURI. *Gazz. chim. ital.* 48, I, 238-47(1918).—Many authors state that CHI<sub>3</sub>, both as a solid or in soln. in org. solvents, is changed in the light. Thus the CS<sub>2</sub> soln. is said to be very sensitive to light and is quickly changed to violet: EtOH, CHCl<sub>3</sub>, benzine and petr. ether solns. behave similarly. The various statements in the literature are fully reviewed. C. and M. have now investigated the decompn. of CHI<sub>3</sub> in 19 org. solvents. The results show that the relative velocity of decompn. for the solvents used decreases in the order: petr. ether, CS<sub>2</sub>, AcOEt, PhCH:CHCHO, Me<sub>2</sub>CO, guaiacol, CHBr<sub>3</sub>, Et<sub>2</sub>O, turpentine, oleic acid, MeOH, EtOH, C<sub>6</sub>H<sub>6</sub>, PhNO<sub>2</sub>, AmOH, CHCl<sub>3</sub>, allyl alc., glycerol and olive oil. With respect to the % of the CHI<sub>3</sub> changed for the same time and concn. the results were as follows: CHCl<sub>3</sub> 49.60, glycerol 39.16, Me<sub>2</sub>CO 31.8, allyl alc. 22.85, CS<sub>2</sub> 13, AmOH 8.05, guaiacol 6.56, CHBr<sub>3</sub> 6.55, EtOH 6.33, PhNO<sub>2</sub> 5, Et<sub>2</sub>O 3.84, AcOEt 3.55, C<sub>6</sub>H<sub>6</sub> 3, oleic acid 1.90, PhCH:CHCHO 1.82, MeOH 0.65, petr. ether 0.294, turpentine trace, olive oil trace. By a comparison of these 2 sets of results, it is clear that in the group of alcs., while the velocity of decompn. of CHI<sub>3</sub> diminishes with the increase of the number of C atoms, the quantity of CHI<sub>3</sub> decompd. increases and besides in the case of MeOH the I and HI produced cause a partial oxidation with the formation of aldehyde. In the group of unsatd. compds. there is an analogous behavior but the velocity of decompn. of CHI<sub>3</sub> decreases with the increase of the mol. wt. while the amt. of CHI<sub>3</sub> decompd. diminishes. Iodo compds. are formed by the addition of I to the unsatd. bond. With regard to the other solvents it was found that while the hydrocarbons of petr. ether which are very stable in the light permit the rapid decompn. of CHI<sub>3</sub> this decompn. stops very soon, while for C<sub>6</sub>H<sub>6</sub>, a very stable aromatic hydrocarbon, the decompn. is slow and the amt. of CHI<sub>3</sub> decompd. is also small. The behavior of turpentine resembles that of petr. ether. For CHCl<sub>3</sub>, CHBr<sub>3</sub> and CS<sub>2</sub>, of which the latter 2 are very easily transformed in the light, it was also found that they markedly increase the decompn. of CHI<sub>3</sub>. In CHCl<sub>3</sub> the velocity of decompn. is slow but the amt. transformed is large and this is related to its small stability in light, as was shown by blank expts. In CS<sub>2</sub> the transformation is complete in air but in a sealed container stops presently. Me<sub>2</sub>CO which is easily condensed in the presence of halogens and halogen acids aids the decompn. of CHI<sub>3</sub> much by producing I and HI and condensation products of Me<sub>2</sub>CO itself. Of all the solvents used olive oil was the best for in it the decompn. of CHI<sub>3</sub> is nearly zero and this fact has practical importance. Glycerol, how-



ever, is to be rejected as a solvent for while it strongly retards the velocity of decompn. of  $\text{CHI}_3$ , it does not prevent the decompn. of a large amt. even out of contact with the air and produces much I and HI. The advantage of glycerol is that the  $\text{CHI}_3$  soln. may be dild. with  $\text{H}_2\text{O}$  without pptg. it. Such glycerol and hydroglycerol solns. should be used at once, especially if used hypodermically, because on standing for a time they become too acid and irritating. The  $\text{CHBr}_3$  solns. of  $\text{CHI}_3$  ought to be valuable since they give rise to iodobromo org. compds. and the action of Br may be added to that of I. The clinical use of some of these solns. will be reported upon in another paper.

E. J. WITZEMANN.

**Oxidation of santonin by organic peracids.** G. CUSMANO. Florence. *Gazz. chim. ital.* 48, I, 248-53(1919).—Four monohydroxysantonins,  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$ , have been described and none have been obtained by *in vitro* oxidation of santonin, (a). The first 2 are the so-called santogenins found in the urine of dogs and rabbits, resp., by Jaffe after feeding (a). The 3rd is artemisin, that accompanies (a) in the flowers of *Artemisia maritima*. The 4th is isoartemisin, obtained by Wedekind and Koch (*Ber.* 38, 1845(1905)) by the action of alkali on monochlorosantonin. W. and K. could not regulate the attack of the oxidizing agent. Angeli and Marino (*C. A.* 2, 2953) found that a dihydroxysantonin,  $\text{C}_{15}\text{H}_{11}\text{O}_6$ , could be obtained by the action of dil.  $\text{KMnO}_4$ . C. (*Rend. soc. chim. ital.* 1914, 1) found that oxidation could be further controlled by using perbenzoic and peracetic acids and obtained 2 mono-HO derivs., one of which is identical with the isoartemisin of W. and K.; the other was new and was assigned the letter  $\epsilon$ . (a) + 2 mols. perbenzoic acid in  $\text{CHCl}_3$  were kept in an open beaker at  $10^\circ$  for some days until all the  $\text{CHCl}_3$  was evapd. In the solid residue freed from  $\text{BzOH}$  most of the (a) was found unchanged. After exposing to the light nearly all of the material rapidly became yellow. Some colorless crystals remained which deposited from 95% EtOH isoartemisin or  $\delta$ -hydroxysantonin, (b), white prisms, m.  $212^\circ$ . The alk. soln. used to remove the  $\text{BzOH}$  was acidified and filtered and after 2 days sepd.  $\epsilon$ -hydroxysantonin, (c), rosets, m.  $154^\circ$ . A better result was obtained thus: 10 g. (a) + 10 cc. perhydrol + 35 cc. glacial AcOH were heated in a  $\text{H}_2\text{O}$  bath at  $80^\circ$ . After 20 hrs. 10 cc. perhydrol were again added and heating was continued 20 hrs. more. The soln. was then concd. to a syrup on the  $\text{H}_2\text{O}$  bath and treated with a soln. of  $\text{Na}_2\text{CO}_3$  which dissolved a part and left a resinous mass. This was washed with  $\text{H}_2\text{O}$  and dissolved in boiling EtOH; impure (b) sepd. which after exposure to light was extd. again with EtOH. The various fractions of crystals were treated in this way and the (c) was always recovered from the EtOH extn. mother liquors. 15 g. (a) gave 2 g. (b) and 1.2 g. (c) in this way; much unchanged (a) was recovered. (c) remains unchanged when heated for some time at  $154^\circ$ , it does not change color in the light and fails to react with  $\text{PhCNO}$  even in the sealed tube at  $130^\circ$ . In the cold it reacts with  $\text{PhNHNH}_2$  to give the *monophenylhydrazone* of (c), m.  $280^\circ$ . Although (a) dissolves easily in aq. alkalis, (c) does not dissolve, but in hot EtONa solns. it gives the blood-red salt of hydroxysantoninic acid. This soln. dild. with  $\text{H}_2\text{O}$  is decolorized after long heating. On cong. the soln. the salt seps. as a glassy mass. The free acid is obtained as a colorless oil, little sol. in cold  $\text{H}_2\text{O}$ , that crysts. slowly, m.  $100^\circ$  (about); in dil.  $\text{H}_2\text{SO}_4$  it gives (c) again. 0.3 g. (c) in 3 cc.  $\text{HCl}$  (d. 1.19) dissolves rapidly and a new *monochlorosantonin*, (d),  $\text{C}_{15}\text{H}_{11}\text{ClO}_5$ , m.  $196^\circ$ , is obtained. (d) is thus isomeric with that of Sestini (*Bull. soc. chim.* 5, 202(1866)) which m.  $235^\circ$  and is more stable with dil. boiling EtOH. (d) is transformed into (c) by boiling a few mins. with dil. EtOH. The same reaction takes place in alc. KOH. (d) treated in EtOH with powdered Zn and a few drops of AcOH gave (a).

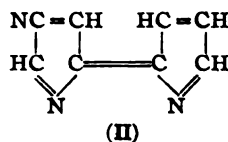
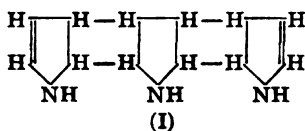
E. J. WITZEMANN.

**The aromatic nitro derivatives.** VII. The formation of the nitrohydrazo compounds. M. GIUA. Sassari. *Gazz. chim. ital.* 48, II, 8-17(1918); cf. *C. A.* 8, 2731;

9, 1479, 2089; 10, 598, 1175, 1858; 11, 1163.—The prepn. of the  $\text{NO}_2$  derivs. of hydrazobenzene and its homologs is not possible by direct nitration. The one method known is that of Fischer (*Ann.* 190, 131(1878); 253, 2(1889)) which consists in treating *o*- or *p*-chloronitro derivs. of  $\text{C}_6\text{H}_4$  with  $\text{PhNHNH}_2$  or its derivs. (Willgerodt, etc., *J. prakt. Chem.* [2] 37, 345, 454(1888); 40, 264(1889); 43, 177(1891); 44, 67(1891)). Much work has been done on the behavior of  $\text{NO}_2$  compds. with  $\text{PhNHNH}_2$  but mostly with poly- $\text{NO}_2$  derivs. with the  $\text{NO}_2$  groups meta with respect to each other. Sommer (*J. prakt. Chem.* 67, 513(1903)) studying the action of  $\text{PhNHNH}_2$  on trinitrotolyl-methylnitroamine and trinitromethyl-*p*-toluidine obtained hydrazobenzene. Thus with labile  $\text{NO}_2$  groups  $\text{PhNHNH}_2$  has not a reducing but a substituting action. This reaction G. has found is general and constitutes a good method of prepn. of nitrohydrazo compds. G. has studied the action of  $\text{PhNHNH}_2$  on  $\beta$ - and  $\gamma$ - $\text{MeC}_6\text{H}_4(\text{NO}_2)_2$  and on 3,4,5-( $\text{O}_2\text{N}$ ) $_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$  and its Me ester, compds. containing a mobile  $\text{NO}_2$  as G. has previously shown. It was found that the hydrazo compds. are easily formed in EtOH at room temp. and sep. as orange-yellow cryst. compds. The  $\text{HNO}_2$  formed by the reaction reacts with the excess of  $\text{PhNHNH}_2$  thus:  $\text{PhNHNH}_2 + 2\text{HONO} \rightarrow 4\text{H}_2\text{O} + 4\text{N}_2 + 3\text{C}_6\text{H}_6$ . The nitrohydrazo compds. thus obtained that have a  $\text{NO}_2$  group in the *o*-position to the hydrazino group easily lose a mol.  $\text{H}_2\text{O}$  to give nitrosoazo compds. or "azimidoxides." The action of  $\text{PhNHNH}_2$  on 3,4,6-( $\text{O}_2\text{N}$ ) $_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$  is characteristic. In the presence of the  $\text{CO}_2\text{H}$  group the formation of the phenylhydrazide was to be expected. With *sym*-( $\text{O}_2\text{N}$ ) $_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$  a white substance, m.  $145^\circ$  (decompn.) is formed but with the 1st acid the reaction is rapid and a yellow solid seps. at once. 2 g.  $\gamma$ - $\text{MeC}_6\text{H}_4(\text{NO}_2)_2$  in 10 cc. MeOH treated with 1.04 g.  $\text{PhNHNH}_2$  gave a dark red color at once and sepd. 2,4-dinitro-5-methylhydrazobenzene, (a), red-yellow plates, m.  $155^\circ$  (decompn.). (a) in alc. treated with dry HCl becomes carmine-red and seps. 2-nitroso-4-nitro-5-methylazobenzene, golden-yellow laminas, m.  $120-1^\circ$ .  $\beta$ - $\text{MeC}_6\text{H}_4(\text{NO}_2)_2$  reacting with  $\text{PhNHNH}_2$  in EtOH seps. in 10 mins. 2,6-dinitro-5-methylhydrazobenzene, red prisms, m.  $137^\circ$  (decompn.) which in abs. EtOH with HCl gas gives nitroso-nitro-methylazobenzene, shining needles, m.  $154^\circ$ . 5 g. 3,4,6-( $\text{O}_2\text{N}$ ) $_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$  in 20 cc. EtOH + 6 g.  $\text{PhNHNH}_2$  gave a ppt. of 2,4-dinitro-5-carboxyhydrazobenzene, (b), red-yellow crystals, m.  $135^\circ$  (decompn.). A brownish  $\text{H}_2\text{O}$ -insol. compd. that m. below  $100^\circ$  was obtained, but not studied further. Aq. (b) with  $\text{AgNO}_3$  gave the silver salt of (b) which rapidly decomps. (b) reduces  $\text{NH}_3\text{-Ag}_2\text{O}$  solns. rapidly. (b) in MeOH with dry HCl gas gave 2-nitroso-4-nitro-5-carboxyazobenzene, golden yellow needles, m.  $244^\circ$  (decompn.). 1.75 g. 3,4,6-( $\text{O}_2\text{N}$ ) $_3\text{C}_6\text{H}_2\text{CO}_2\text{Me}$  in 5 cc. EtOH + 1.5 g.  $\text{PhNHNH}_2$  gave at once 2,4-dinitro-5-carbomethoxyhydrazobenzene, orange-yellow, m.  $177-8^\circ$ . From MeOH containing  $\text{C}_6\text{H}_6$  are obtained prismatic yellow needles, m.  $147^\circ$ , begin to evolve gas  $175-8^\circ$ , which are apparently an isomer (Willgerodt, Böhm, *J. prakt. Chem.* 43, 482(1891)). E. J. W.

**Pyrrole blacks.** A. ANGELI. *Gazz. chim. ital.* 48, II, 21-5(1918).—In previous papers (*C. A.* 11, 793) A. has described the coloring matters obtained by the action of  $\text{H}_2\text{O}_2$  in AcOH solns. on pyrrole. But pyrrole should give coloring matters under other conditions also. Expts. have shown that the majority of the oxidizing agents give intensely colored black or brown products with pyrrole, some of which are sol. and some insol. in alkalis. They were all obtained in acid solns. A soln. of  $\text{C}_4\text{H}_5\text{N}$  in AcOH treated with  $\text{K}_2\text{Cr}_2\text{O}_7$  soln. ppts. a black powder at once, and if a piece of cotton moistened with the soln. is treated with  $\text{K}_2\text{Cr}_2\text{O}_7$  a black dye fast to light and soap is produced upon the fibers. The black ppt. contains Cr even after contact with dil.  $\text{H}_2\text{SO}_4$  for some days although much of it is removed in this way. The black product easily dissolves when further treated with  $\text{K}_2\text{Cr}_2\text{O}_7$  + dil.  $\text{H}_2\text{SO}_4$ . By extg. with  $\text{Et}_2\text{O}$  maleinimide identical with that prepd. by Plancher is obtained. This

shows that the coloring matter contains the pyrrole residue and just as  $\text{PhNH}_2 \rightarrow$  aniline black  $\rightarrow$  quinone so pyrrole  $\rightarrow$  pyrrole black  $\rightarrow$  maleinimide, in which the latter is the quinone of pyrrole. The pyrrole black from  $\text{H}_2\text{O}_2$  gives succinimide on further oxidation. Similar coloring matters are obtained by oxidizing pyrrole in dil.  $\text{H}_2\text{SO}_4$  soln. in which pyrrole is polymerized. A. has shown that tripyrrole as well as the amorphous base formed at the same time both give black ppts. when treated with  $\text{K}_2\text{Cr}_2\text{O}_7$  in dil.  $\text{H}_2\text{SO}_4$ . But if the  $\text{H}_2\text{SO}_4$  solns. are first treated with excess  $\text{AcONa}$  only a little black ppt. is formed after some days. The limpid  $\text{H}_2\text{SO}_4$  soln. of  $\text{C}_4\text{H}_5\text{N}$  becomes green at once on adding  $\text{H}_2\text{O}_2$  and in 1 hr. a black powder is pptd. which is not sol. in alkali. A similar reaction is obtained with  $\text{FeCl}_3$ . These facts demonstrate that the formation of pyrrole black is probably preceded by a more or less rapid polymerization of pyrrole. The unproved formula (I) has been assigned to tripyrrole (Dennstedt, Voigtländer, *Ber.* 27, 478(1894)) which A. considers does not explain its behavior. He considers that at least part of the mols. may be united as in (II). Such products as (II) could explain the formation of the products obtained. A. attempted to treat a soln. of pyrrole with  $\text{PbO}_2$  (by which indacene (indace) is



oxidized to dehydroindacene) and obtained a brown substance, but as yet no definite products. Samuely has explained the formation of melanin by assuming that the albuminoid mol. gives up a cyclic compd., which on the basis of A.'s expts. may be pyrrole. Pyrrole derivs. are widely diffused in organisms. It is known that tyrosine with  $\text{O}_2$  and tyrosinase at first becomes red, then brown and finally seps. a black product, a melanin, while the liquid is perfectly colorless. This A. interprets as an oxidation in which the side chain is converted into pyrrole by the destruction of the aromatic ring, which latter process is favored by the  $p\text{-OH}$  group of tyrosine. A. has not had opportunity to study the action of oxidases on pyrrole and its derivs.

E. J. WITZEMANN.

**Electrolytic reduction of hydroxyazo compounds.** E. PUXEDDU. Univ. Cagliari. *Gazz. chim. ital.* 48, II, 25-30(1918).—P. has previously studied (*Gazz. chim. ital.* 35, II, 598(1905); 36, II, 1(1906)) the reduction of hydroxyazo compds. with  $\text{PhNHNH}_2$  and found that  $\text{HOR.N:NPh} + 2\text{PhNHNH}_2 \rightarrow \text{HOR.NH}_2 + \text{PhNH}_2 + 2\text{C}_6\text{H}_6 + 2\text{N}_2$  expresses the results. The expts. were extended to the azo derivs. of the aromatic HO acids and HO aldehydes and to the diazo compds. of the phenols (*C. A.* 10, 2882) with similar results so that this was a convenient way of obtaining aminophenols, diaminophenols, aminohydroxy acids and aminohydroxy aldehydes (*C. A.* 10, 2881). P. has now studied the electrolytic reduction of some of the azo derivs. The results on the reduction of  $p\text{-HOC}_6\text{H}_4\text{N}_2\text{Ph}$  are given here. The work of Noyes and Clement (*Ber.* 26, 990(1893)) and Gattermann (*Ber.* 26, 1844(1893)) on the electrolytic reduction of  $\text{PhNO}_2$  is fully reviewed. P. found that in the electrolytic reduction of hydroxyazo compds. the reaction takes place thus:  $\text{HOR.N:NR}' + 2\text{H}_2 \rightarrow \text{HORNH}_2 + \text{R}'\text{NH}_2$  in which the double N bond is broken and its affinities are satd. with  $\text{H}_2$  developed in the cathode liquid. Hydroxyazo compds. have not previously been reduced in this way. The expected result was obtained. The app. used was simple. A porous cup containing 5 g.  $p\text{-HOC}_6\text{H}_4\text{N}_2\text{Ph}$  in pure EtOH containing 25 g. HCl and a Pt plate were placed in a cylindrical glass beaker containing an HCl-EtOH soln. and a Pt anode. The reduction was carried on slowly with 1.5-2.0 amp. at 6

volts for 96 hrs. (current d. 0.088 amp. per sq. cm.) and gave a brown liquid which on evapn. and cooling sepd. reddish white prismatic crystals. After treating with  $\text{NaHCO}_3$  the  $p\text{-HOC}_6\text{H}_4\text{NH}_2$  sepd. as red leaves, m.  $184-5^\circ$  (decompn.), which gives Loessen's reaction with  $\text{HCl}$  and  $\text{Ca}(\text{OCl})_2$  soln. (a violet, then green color). The mother liquor from the  $p\text{-HOC}_6\text{H}_4\text{NH}_2$  alkalinized with  $\text{Na}_2\text{CO}_3$  and extd. with  $\text{Et}_2\text{O}$  gave finally some  $\text{PhNH}_2$  also. P. also attempted to reduce  $p\text{-HOC}_6\text{H}_4\text{N}_2\text{Ph}$  in a mixt. of 150 cc. concd.  $\text{H}_2\text{SO}_4$  + 30 cc. glacial  $\text{AcOH}$  in the same app. under the same conditions. No  $p\text{-HOC}_6\text{H}_4\text{NH}_2$  was obtained. E. J. WITZEMANN.

Some analogies in the behavior of the rings of diazoimide and diazomethane. E. OLIVERI-MANDALA. *Gazz. chim. ital.* 48, II, 35-9(1918).—Guided by the analogies of the ring of  $\text{N}_2\text{H}$  to that of  $\text{N}_2\text{CH}_2$  O.-M. has carried out a series of researches part of which have already been published (*C. A.* 5, 1091, 2636, 3571; 6, 625; 7, 2934, 3495, 3755; 8, 1272; 9, 70, 71; 10, 596, 1514) and which are briefly summarized here. It was found that whatever the mechanism of reaction, both compds. show a great tendency to assume other atoms and form more stable rings containing more atoms. While  $\text{CH}_2\text{N}_2$  combines directly with 2 atoms by opening the ring,  $\text{N}_2\text{H}$  does not do this but the H and triazo group are added first and then under suitable conditions the ring is reformed. This latter step is only possible with compds. containing acetylene or unsatd. hydrocarbon bonds thus: (1)  $>\text{C}:\text{N}:\text{R} + \text{N}_2\text{H} \longrightarrow \text{N}_2\text{CH}:\text{N}:\text{R}$  or (2)  $-\text{C}\equiv\text{C} + \text{N}_2\text{H} \longrightarrow -\text{HC}:\text{CN}_2$  and the 2 products thus formed may be isomerized into  $\text{N}:\text{N}:\text{NR}:\text{CH}:\text{N}$  and  $\text{NH}:\text{N}:\text{N}:\text{C}(\cdot):\text{C}(\cdot)$ , resp. With compds. with the ethylene

bond addition compds. are obtained showing that unlike  $\text{CH}_2\text{N}_2$ , the  $\text{HN}_2$  adds without opening the N ring and these react again if the new mol. contains an unsatd. valence. With  $\text{RN}:\text{CO}$  derivs.  $\text{N}_2\text{H}$  gives only  $\text{RNHCON}_2$  and not a deriv. of oxytetrazole.  $(\text{CN})_2$  reacts with  $2\text{HN}_2$  to give  $\text{HN}:\text{N}:\text{N}:\text{N}:\text{C}:\text{C}:\text{N}:\text{N}:\text{NH}$ , thus closing both

rings. The behavior of some azides of derivs. of thiocarbamic acids in the presence of alkalis bring out the similarities with  $\text{CH}_2\text{N}_2$  still more strongly. Thus  $\text{N}_2\text{HC}:\text{CO}:\text{NHR}$  gives  $\text{N}:\text{N}:\text{CH}:\text{COH}:\text{NR}$  while  $\text{N}_2\text{CSNHR}$  gives  $\text{N}:\text{N}:\text{N}:\text{C}(\text{SH})\text{NR}$ . The reactions

are classed in 2 groups of 5 types: (I) formation of azides (a) with compds. with adjacent double bonds like esters of isothiocyanic acid, isocyanides, ketenes and  $\text{CS}_2$ , thus:  $\text{R}:\text{N}:\text{C}:\text{S} + \text{N}_2\text{H} \longrightarrow \text{RNH}:\text{CSN}_2$ ; (b) with compds. having ethylene bonds, by which quinone gives  $\text{HOC}:\text{CH}:\text{CH}:\text{C}(\text{OH})\text{CH}:\text{CN}_2$ ; (II) formation of tetrazole and

oesotriazole rings (c) with compds. containing a bivalent C atom, by which  $:\text{C}:\text{N}:\text{R} \longrightarrow \text{RN}:\text{N}:\text{N}:\text{N}:\text{CH}$ ; (d) with compds. having triple bonds between C and N such as

$(\text{CN})_2$ ,  $\text{CNBr}$ , and  $\text{NCCO}_2\text{Et}$ ; (e) with compds. having the acetylene bond such as  $(\text{HO}_2\text{CC}\cdot)_2$ , propiolic acid and propargylic acid. E. J. WITZEMANN.

Hydrosulfonic derivatives of citral. GIOVANNI ROMEO. Univ. Messina. *Gazz. chim. ital.* 48, I, 45-52(1918).—Citral contained in the essential oils of lemon, of *Backhousia citrodora*, of lemongrass (*Andropogon citratus*), etc., forms various complexes with alk. sulfites. The normal combination of  $\text{NaHSO}_3$  was used to purify the aldehyde (Semmler, *Ber.* 23, 2966(1890); Dodge, *Am. Chem. J.* 12, 553(1890)). D. also found  $\text{C}_{12}\text{H}_{16}\text{O}_2\cdot 2\text{NaHSO}_3\cdot 4\text{Na}_2\text{SO}_3\cdot 50\text{H}_2\text{O}$ . Tiemann (*Ber.* 31, 3297) studied these derivs. and obtained a new monohydrosulfonic deriv. as well as 2 dihydrosulfonic derivs. The normal  $\text{NaHSO}_3$  compd. of citral, (a),  $\text{Me}_2\text{C}:\text{CH}:(\text{CH}_2)_2\text{CMe}:\text{CH}:\text{CH}(\text{OH})\text{SO}_3\text{Na}$ , is formed quant. when the aldehyde is treated with  $\text{NaHSO}_3$  containing enough free acid ( $\text{AcOH}$  for instance). The cryst. compd. gives citral again when treated with

NaOH. The stable dihydrodisulfonic deriv. of citral (*b*),  $C_9H_{17}(SO_3Na)_2.COH$ , is formed quant. when (*a*) is allowed to stand for some hrs. in contact with an excess of  $NaHSO_3$  soln. which is kept acid. (*b*) is a very deliquescent solid which is not decompd. even by hot alkalis and contains the COH group unchanged. Four formulas are possible depending on how the  $NaHSO_3$  mols. add to the 2 unsatd. bonds. The labile dihydrodisulfonic deriv. of citral (*c*),  $C_9H_{17}(SO_3Na)_2.CHO$ , is formed when aq.  $Na_2SO_3$  is agitated with citral and the NaOH formed neutralized with an acid. (*c*) is decompd. by alkalis into  $NaHSO_3$  and citral. The COH group in (*c*) is free and the compd. may be represented by 4 formulas. (*c*) is a cryst. compd. neutral in reaction and is converted into (*b*) by inorg. acids and more slowly by org. acids. (*c*) when agitated with aq. citral easily loses a mol. of  $NaHSO_3$ , giving sodium citralhydrosulfonate,  $C_9H_{16}(SO_3Na).COH$ , which is likewise a solid, the aq. solns. of which give citral on adding KOH. It contains the COH group unchanged. Besides the above there should be 4 isomeric trihydrotrisulfonic derivs. of citral, or (*b*) and (*c*) with the COH bound to  $NaHSO_3$ . In 1905 R. (*Atti VI Congresso intern. chim. appl., Roma, I, 295*) reported that 3 mols.  $NaHSO_3$  are combined with citral in aq. soln. and now he has isolated the cryst. compd. It was obtained as follows: 15 g. citral were added to a soln. of 80 g. dry  $Na_2SO_3$  + 32 g.  $NaHSO_3$  in 350 cc.  $H_2O$  and the mixt. agitated at ordinary temp. After about  $\frac{3}{4}$  hr. the mixt. was heated on the  $H_2O$  bath. The soln. was cooled and extd. twice with a little  $Et_2O$  and then concd. to 150 cc. on the  $H_2O$  bath; much  $Na_2SO_3$  crystd. out. The filtrate was concd. to 80 cc. and sepd. mixed sulfitcs and some org. salts. The yellowish filtrate was pptd. with about 6 vols. of 95%  $EtOH$  and allowed to stand 36 hrs. The ppt. was washed 4 times with  $EtOH$  and placed in a desiccator for a few days. The white product (31 g.) was pulverized and boiled under a condenser with 400 cc.  $MeOH$ . After filtering hot and standing a few days a trihydrotrisulfonic deriv. (*d*) sepd. as crystals. The soln. on evapg. gave a hygroscopic paste which was a mixt. of (*b*) or (*c*) with (*d*). It was further purified by extg. 3 times on a  $H_2O$  bath with 300 cc.  $EtOH$  in all. 3.5 g. of a white solid substance (*d*) was obtained, which is not deliquescent, reacts neutral in 10% soln. in  $H_2O$  and seps. citral when treated with KOH soln.  $HCl$  does not decomp. (*d*). The crystals of (*d*) that sepd. from the  $MeOH$  soln. on standing differ from the above in that they are not decompd. by KOH. Thus both the labile and stable forms of (*d*) were isolated in the cryst. form.

E. J. WITZEMANN.

The orientation of anisotropic liquids in contact with crystals (GRANDJEAN) 2. Structure of crystals in extremely thin plates (MARCELIN) 2. Micro-elementary analysis of compounds containing sulfur, halogen and nitro groups (GRANACHER) 7. Micro-elementary analysis of organic substances (DUBSKY, *et al.*) 7. Apparatus for concentrating vinegar and acetic acid (U. S. pat, 1,291,025) 1.

Meyer, H. A. J.: *Beknopt leerboek der organische chemie*. 7th Ed. bewerkt door J. W. Beekman. Groningen: P. Noordhoff. 178 pp. f 2.25, geb. f 2.75. For review see *Chem. Weekblad* 16, 86(1919).

Naphthol. R. N. WALLACH. U. S. 1,291,300, Jan. 14. In the manuf. of naphthol, a concd. aq. soln. of a naphthalenesulfonate at a temp. of about  $100^\circ$  is led into a closed vessel containing fused caustic alkali at a temp. of about  $300^\circ$ .

## II. BIOLOGICAL CHEMISTRY.

## A. GENERAL.

HATTIE L. HEFT AND WILLIAM J. GIES.

FRANK P. UNDERHILL.

The work of C. A. Pikelharing up to his seventieth birthday. H. ZWAARDEMAKER. *Arch. néerl. physiol.* 2, 451-64(1918); *Physiol. Abstracts* 3, 365.—The introductory paper to a jubilee number of *Arch. néerl. physiol.* in honor of Prof. Pikelharing. A brief account with bibliography is given of Pikelharing's valuable contributions to science. E. J. C.

The hydrolysis of proteins in the presence of extraneous materials and the origin and nature of the "humin" of a protein hydrolysate. ROSS AIKEN GORTNER. *Science* 48, 122-4(1919).—The conclusions of McHargue (*C. A.* 12, 375) are questioned. With reference to the applicability of the Van Slyke method for protein analysis to mixts. of casein and starch it is stated that "(1) proteins cannot be hydrolyzed with 20% HCl at atm. pressure in the presence of a considerable quantity of carbohydrates without appreciably altering certain of the N fractions of a Van Slyke analysis and (2) a Van Slyke analysis applied to feeding stuffs, contg. as they do non-protein nitrogenous compds., gives no valid index as to the presence or absence of any individual amino acid." McH. does not recognize that the insol. residue obtained in a casein-starch digestion is humin. E. J. C.

The hydrolysis of kafirin. D. BREESE JONES AND CARL O. JOHNS. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 36, 323-34(1918).—Kafirin, the alc.-sol. protein of kafir, *Andropogon sorghum*, yields the following % of amino acids: glycine, 0.0; alanine, 8.08; valine, 4.26; leucine, 15.44; proline, 7.80; phenylalanine, 2.34; aspartic acid, 2.27; glutamic acid, 21.23; tyrosine, 5.49; cystine, 0.84; arginine, 1.59; histidine, 1.12; lysine, 0.95; tryptophan, present;  $\text{NH}_4$ , 3.46; total, 74.87. The details of the methods used in the hydrolysis and detns. are given in full. A. P. LOTHEP.

The effect of diffusion upon the conductivity of living tissue. W. J. V. OSTERHOUT. Harvard Univ. *J. Biol. Chem.* 36, 489-90(1918).—O. has shown "that electrolytes may be divided into two classes with respect to their effect on the elec. cond. of living tissues: those which produce a rise in resistance followed by a fall and those which produce only a decrease in resistance. Salts with bivalent and trivalent cations belong in the first class while those with monovalent cations belong in the second. Recently some apparent exceptions to this rule have been met with. The behavior of certain substances is anomalous in 3 respects: although they are monovalent salts they produce a rise in resistance, the rise is unusually brief in duration, and it occurs in dead as well as in living tissue." If tissue of *Laminaria* is transferred from artificial sea water to a similar soln. in which RbCl has been substituted for NaCl, there is a sharp rise in resistance which soon disappears. A drop in resistance occurs if the tissue is again transferred to ordinary artificial sea water. If the NaCl is substituted by LiCl, the resistance drops and there is a rise on replacing in the ordinary soln. Similar effects were observed with dead tissue but of smaller magnitude. "It is evident that these effects are due to diffusion. On transferring from artificial sea water made with NaCl to one in which RbCl takes the place of NaCl, the mols. of NaCl diffuse out of the tissues more rapidly than the larger mols. of RbCl can diffuse inward. Hence there is a temporary deficiency of salt in the tissue and the resistance accordingly rises. On the other hand, the smaller mols. of LiCl diffuse in faster than NaCl can diffuse out, causing a temporary excess of salt, which lowers the resistance. Any confusion which might be caused by disturbances of this sort may be easily avoided by control expts. made on dead tissue." A. P. LOTHEP.

The proteins of the peanut, *Arachis hypogaea*. III. The hydrolysis of arachin. CARL O. JOHNS AND D. BRERKE JONES. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 36, 491-500(1918).—Arachin, the principal protein in the peanut, *Arachis hypogaea*, yields on hydrolysis the following % of the various amino acids: glycine, 0.00; alanine, 4.11; valine, 1.13; leucine, 3.88; proline, 1.37; phenylalanine, 2.6; aspartic acid, 5.25; glutamic acid, 16.69; tyrosine, 5.5; cystine, 0.85; arginine, 13.51; histidine, 1.88; lysine, 4.98; tryptophan, present;  $\text{NH}_4$ , 2.03; total, 63.78. The % of the basic amino acids was detd. by Van Slyke's method as well as by the direct method of Kossel and Kutscher and the values obtained by both methods agreed closely. More lysine was obtained by the former method than could be isolated by the direct method.

A. P. LOTHROP.

Action of enzymes on human placenta. VICTOR J. HARDING AND ELRID G. YOUNG. McGill Univ. *J. Biol. Chem.* 36, 575-80(1918).—Normal human placenta is readily digested by pepsin, trypsin and erepsin. When fed to a dog in the place of the beef in a diet of lean beef and carbohydrate, its digestibility is about the same as that of lean meat. The animals readily ate the ration containing the placenta powder and no ill effects on them were noticed. The placenta had almost the same N content (12.46%) as the meat and contained 8.82% of amino acid N (70.8% of the total N). Medical literature contains many references to placental feeding but there is no record of any study of the action of digestive juices upon the protein of the placenta or of its digestibility.

A. P. LOTHROP.

The globulins of the jack bean, *Canavalia ensiformis*. JAMES B. SUMNER. Cornell Univ. Med. College, Ithaca, N. Y. *J. Biol. Chem.* 37, 137-41(1919).—Jones and Johns (*C. A.* 11, 466) have isolated 2 globulins, concanavalin and canavalin from the jack bean but S. has found that it contains three globulins, two of which readily crystallize upon dialysis while the third appears to be incapable of crystg. The uncrystallizable globulin consists of spheroids which are readily sol. in 1% NaCl soln. This forms the greater part of the ppt. obtained by dialysis and should be called canavalin, the name applied by Jones and Johns to the ppt. obtained by complete satn. with  $(\text{NH}_4)_2\text{SO}_4$ . A minute amt. of material crysts. as needles which are slowly sol. in 10% NaCl soln. and are not sol. in alk. unless an excess is present. This material S. has named concanavalin B. The third globulin crysts. in bisphenoid form, is present in moderate amts. and is insol. in any but concd. NaCl solns. The crystals when not recently formed probably have an outer layer of protein and will dissolve only in hot NaCl soln. This globulin is called concanavalin A. When jack bean exts. are subjected to dialysis the bisphenoid crystals are pptd. first, the uncryst. spheroids sep. next and the needles are formed last. A partial sepn. can be made by filtering off the ppts. as they appear but it is better to make the sepn. by means of the NaCl solns. previously mentioned. After several repptns. the globulins give no Molisch test but may still contain P. A method is described in detail for the sepn. of the globulins and more data concerning them will be published later.

A. P. LOTHROP.

Globulin of the coconut, *Cocos nucifera*. I. Preparation of coconut globulin. Distribution of the basic nitrogen in coconut globulin. CARL O. JOHNS, A. J. FINKS AND C. E. F. GERSDORFF. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 37, 149-53 (1919).—The principal protein of the endosperm of the coconut is a globulin containing the following % of the basic amino acids: cystine, 1.44; arginine, 15.92; histidine, 2.42; lysine, 5.80; tryptophan, present. The % of free amino N is equal to nearly  $\frac{1}{2}$  of the lysine N as detd. in the Van Slyke analysis. The globulin contains all the basic amino acids necessary for growth and maintenance and in nutrition expts. in which the coconut globulin was the only source of protein in the diet for a prolonged period normal growth was obtained. The results of the nutrition expts. will be published later and a com-

plete hydrolysis of the globulin is also in progress. A method which is not too laborious and time-consuming is described for the prepn. of large amts. of the globulin for use in nutrition and other expts.

A. P. LOTHROP.

**The physicochemical state of the proteins in cow milk.** LEROY S. PALMER AND ROBERT G. SCOTT. Univ. Mo. *J. Biol. Chem.* 37, 271-84(1919).—From a study of cow milk Van Slyke and Bosworth (*C. A.* 9, 1608) have drawn the conclusion "that the albumin of cow's milk is partly in true soln. and partly in suspension, the suspended portion being adsorbed by the casein when the milk is fresh but passing over into true soln. when the milk sours or when HCHO is added to prevent bacterial decompn." P. and S. have repeated and extended the expts. and have failed to confirm these conclusions. "Expts. are reported in which fresh skim milk, skim milk preserved with 5%  $\text{CHCl}_3$ , skim milk preserved with 0.05% HCHO, and the lactic acid whey from fresh skim milk were filtered through Pasteur-Chamberland filtering tubes under pressure. The total protein passing through the filters was detd. in each case by pptn. with Almen's tannic acid reagent, and the non-protein N was detd. in the filtrate from the ppt. thus formed. The amt. of non-casein protein recovered in the filtrate did not in any case exceed 10% of the non-casein protein in the original milk, and in most cases the amt. recovered was considerably less than this figure. There was also only a partial recovery of the non-protein N of the original milk in the expts. with chloroformed and HCHO-treated milk. These results are widely divergent from those reported by previous investigators. The variation in the size of the pores of different Pasteur-Chamberland filters which is indicated by a comparison of our data with those secured by others who have filtered milk through these filters shows conclusively the fallacy of drawing conclusions regarding the true state of soln. of non-casein proteins of milk based on filtration studies of this character." When milk preserved with  $\text{CHCl}_3$  is allowed to stand, the amt. of albumin recoverable by heat coagulation is markedly reduced when compared with the same milk analyzed perfectly fresh. The milk used by Van Slyke and Bosworth was preserved with 5%  $\text{CHCl}_3$  and its effect on reducing the amt. of albumin recoverable by heat coagulation was found in certain cases to be sufficiently great to account for their conclusions that a portion of the albumin is in true and a part in colloidal soln. "One expt. is reported indicating that this depression may be due partially to a pptn. of heat-coagulable protein by the  $\text{CHCl}_3$ . A plausible explanation is thereby offered for the results secured by other investigators who find that chloroformed milk apparently allows less heat-coagulable protein to pass through the Pasteur-Chamberland filter than milk preserved with HCHO or sour milk."

A. P. LOTHROP.

**The state of proteins in cow milk.** L. L. VAN SLYKE AND A. W. BOSWORTH. *J. Biol. Chem.* 37, 285-6(1919); cf. preceding abst.—Porous clay filters have the power of adsorbing some of the constituents of milk serum when it is passed through them and a certain vol. (50-75 cc. in the authors' expts.) must be passed through before const. compn. is attained. As Palmer and Scott used much finer filters, "had they discarded the first 100 cc. or so and then collected a total of 250 cc. or more from which to draw samples for analysis the results obtained by them would have more weight when used to criticize the results secured by us. With respect to their work on chloroformed milk we can only say that the action of  $\text{CHCl}_3$  upon the proteins of milk is a progressive one, due to two or more factors, one of which is the action of the HCl produced. After a few weeks the proteins may be completely pptd. from the milk. The changes noted by them at the end of 7 days are therefore not comparable to the changes which might have taken place in our filtrations lasting from 12 to 36 hrs."

A. P. LOTHROP.

**Amphoteric colloids. III. Chemical basis of the influence of acid upon the physical properties of gelatin.** JACQUES LOEB. *J. Gen. Physiology* 1, 363-85(1919); cf. *C. A.*



13, 326.—Gelatin was treated with an excess of HBr and the amt. of Br combined was detd. The curves showing the amt. of Br combined are approx. parallel with those for osmotic p., viscosity and swelling of the gelatin soln. Thus the curves for osmotic p. are a function of the number of gelatin-Br mols. formed. The influence of HBr on the physical properties of gelatin is due to the fact that gelatin is an amphoteric electrolyte, sparingly sol. in  $H_2O$  at the isoelectric point, but sol. when converted into a salt with a univalent anion like gelatin-Br. The curve for the bromine number (*i. e.*, the number of cc. of 0.01 *N* Br in combination with 0.25 g. gelatin) is parallel with that for osmotic p. Gelatin previously treated with HBr is free of Br at the isoelectric point ( $p_H = 4.7$ ) and on the more alkaline side from this point. On the acid side of the isoelectric point, gelatin is found in combination with Br, the bromine number increasing as the  $p_H$  rises. Titration with NaOH of gelatin previously treated with HBr results in the neutralization of the pure gelatin. This HBr is freed from the gelatin during the titration when the  $p_H = 4.7$ . A comparison of the  $p_H$  values and the bromine numbers shows that over 90% of the Br or HBr found is in combination with gelatin. It is emphasized that colloidal speculations not based on the laws of classical physical chemistry are not warranted.

CHAS. H. RICHARDSON.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Method for producing conductivity water suitable for water culture experiments.

R. B. HARVEY. *Bot. Gas.* 63, 323-4(1917).—The apparatus is entirely of glass, which therefore does away with the possibility of copper and other metals in the distillate, as is likely when any of the more recent types of water stills is used. B. HARROW.

New titration method for the determination of uric acid in urine. J. LUCIEN MORRIS. Washington Univ. and Univ. Ill. Med. Schools. *J. Biol. Chem.* 37, 231-8 (1919).—In the method described the uric acid is pptd. as the Zn salt, the amt. of which is detd. by titration with  $KMnO_4$  in a soln. alk. with  $NaHCO_3$ . The end point used is the blue starch iodide color and because of the mild nature of the oxidation and the excess iodide present there is no fading to confuse the end point. With normal urines the method gives results which are identical with the colorimetric method but with pathological urines there are some irregularities; the cause of which it has so far been impossible to det. Work is in progress on the adaptation of the method to the detn. of the uric acid in blood. Pipet 5 cc. of urine into a 50 or 100 cc. centrifuge tube and add 3 cc. of 10%  $ZnCl_2$  soln. and 25 cc. of  $H_2O$ . Mix with a stirring rod, put in a small piece of litmus paper and add enough 20%  $Na_2CO_3$  soln. with stirring to turn the litmus decidedly blue. Centrifuge for 2-3 min. to remove the heavy ppt. of  $ZnCO_3$ ,  $Zn_3(PO_4)_2$  and Zn urate. Carefully pour off the liquid from the ppt. which is sufficiently packed down to remain in the tube. Dissolve the ppt. with stirring in dil. HCl. To the acid soln. add 15 cc. of satd.  $Na_2HPO_4$  soln. and if necessary a few drops more of dil. HCl to dissolve a ppt. of  $Zn_3(PO_4)_2$ . Finally add 2 cc. of 3% U acetate soln. and while stirring again make alk. with  $Na_2CO_3$ . Centrifuge 2-3 min. and pour the liquid carefully into a 300 to 500 cc. Erlenmeyer flask for titration. None of the uric acid is pptd. in the large excess of phosphates and the Zn and U remove all substances which would interfere in the  $KMnO_4$  titration. Acidify the alk. soln. with HCl and add 25 cc. of 10%  $CaCl_2$  soln. and an excess of solid  $NaHCO_3$ .  $Ca_3(PO_4)_2$  will ppt. when the neutral point is reached but an excess of  $NaHCO_3$  beyond this point is desirable. Add 1 cc. of 10% KI soln., 3 cc. of 0.5% sol. starch soln. (starch will serve but sol. starch gives a better end-point) and enough distd.  $H_2O$  to make the vol. within a few cc. of 250 cc. Titrate with 0.002 *N*  $KMnO_4$  soln. until a blue shade spreads throughout the soln. The color of the drop of  $KMnO_4$  soln. as it hits the surface changes from pink to blue and assists in judging the approach of the end point. It is also an advan-

tage to compare the soln. from time to time with another awaiting titration or with a blank arranged for the purpose. A correction should be made for the amt. of free I necessary to show a perceptible blue color in 250 cc. This can easily be detd. by titrating a blank containing 1 cc. of 10% KI soln., 3 cc. of 0.5% sol. starch soln. and 250 cc. of distd.  $H_2O$ . It ordinarily amounts to 0.8 cc. and this figure should be subtracted from the observed reading. *Prepn. of standard  $KMnO_4$  soln.*: Make up a stock soln. containing 3.166 g. per l. (0.1 N) in the usual manner and keep it in a tightly stoppered amber-colored bottle. After the usual preliminary period, during which the value of the soln. decreases somewhat, the value remains as nearly const. as its use in the prepn. of 0.002 N solns. requires. Measure 10 cc. of the stock soln. into a 500 cc. flask and make up to the mark. Standardize against a standard uric acid-phosphate soln. (Benedict and Hitchcock, *C. A.* 9, 1626) by the titration method already described or standardize in one of the usual ways and calc. its equiv. value in uric acid calcd. on the basis of 1 cc. of 0.1 N  $KMnO_4$  soln. being equal to 7.5 or 7.22 mg. of uric acid. In M.'s experience, 1 cc. of  $KMnO_4$  soln. is equiv. to 7.32 mg. of uric acid when titrated in  $NaHCO_3$  soln.; 3 different 0.1 N stock solns. on diln. gave values of 0.14, 0.143 and 0.193 mg. per 1 cc. of 0.002 N soln. The dil.  $KMnO_4$  soln. will not keep its value longer than for a single day's work.

A. P. LOTHROP.

**Modifications of Benedict's and Folin's quantitative sugar methods.** HOWARD D. HASKINS. Univ. Oregon Med. School. *J. Biol. Chem.* 37, 303-4(1919).—It is possible to substitute  $NaSCN$  for  $KSCN$ , which is very difficult or impossible to obtain, in Benedict's and Folin's sugar reagents. In preparing Benedict's soln., dissolve the Na citrate first in 650 cc. of hot  $H_2O$ , then the monohydrated  $Na_2CO_3$ , and finally 105 g. of  $NaSCN$  (equiv. to 125 g. of  $KSCN$ ). Filter through cloth and add the  $CuSO_4$  soln. without waiting for it to cool. Titrations with urines are identical with the regular reagent and with the substitute. On substituting  $NaSCN$  in Folin's mixt. of salts (*C. A.* 12, 1059) the titration figures are distinctly too low. Correct titrations can be obtained by reducing the amt. of  $NaSCN$  and boiling half as long as directed by Folin (0.5, 1 and 1.5 min. instead of 1, 2 and 3). Both with slow titrations (6 to 8 portions of urine added) and with rapid titration (3 portions) the results were satisfactory. For each estn. use 4 g. of a salt mixt. containing 20 g. of  $NaSCN$ , 60 g. of dry  $Na_2CO_3$ , and 100 g. of  $Na_2HPO_4$ . A small flask is more convenient than a test tube for the analysis.

A. P. LOTHROP.

**The concentration of antitoxic sera.** ANNIE HOMER. *Proc. Physiol. Soc., J. Physiol.* 52, xxxi(1918).—Tricresol, a variable com. product, when used to adjust the reaction of sera preliminary to pptn. of proteins, has to be used in variable amts. C. F. phenol can be used successfully in concns. of 0.45 to 0.5%. H. prefers the preliminary adjustment of the reaction of the plasma to  $P_H$  8.3 to the use of either phenol or tricresol. Cf. *C. A.* 12, 1652, 2009.

J. F. LYMAN.

**Blood volume.** A method for its determination, with data for dogs, cats and rabbits. W. J. MEEK AND H. S. GASSER. *Am. J. Physiol.* 47, 302-17(1918).—A sample of blood is drawn to serve as a control. To 10 cc. of this freshly drawn blood 10 cc. of a 1.0% soln. of acacia are added and the acacia is detd. as furfuralphloroglucide by the method of Kröber (*J. Landw.* 48, 357). For each kg. of body wt. 4 cc. of a 20% acacia soln. (in 0.9% NaCl) are injected intravenously, and 15 mins. allowed for mixing in the body. A 10-cc. sample of blood is then drawn and the acacia in it is detd. as in the control. Blood vol. is calcd. by using the formula

$$\frac{20 \times \text{cc. of acacia}}{\text{blood vol. in cc.}} = \frac{\text{wt. of phloroglucide in blood sample}}{\text{wt. of phloroglucide in control}}$$

This vol. must be corrected for the difference between the amt. of blood drawn and

the acacia injected. While the amt. of phloroglucide obtained from a mixt. of acacia and blood is not as high as that from a  $H_2O$  soln. of acacia, still it is claimed that under all possible conditions the percentage recovery is approx. const. Acacia in the amts. recommended is harmless to animals and does not expand the blood vol. during the time necessary for a detn. By this method the blood vol. in the dog is 9.72%, in the cat 5.50%, and in the rabbit 5.44%, respectively, of the body wts. J. F. LYMAN.

Use of amyl alcohol in histological technic and especially in the Romanovskii method. A.-CH. HOLLANDE. *Compt. rend. soc. biol.* 81, 223-5(1918).—H. recommends the substitution of amyl alc. for abs. EtOH in histological technic. The stained sections are passed successively through pure amyl alc. (5-10 mins.), a mixt. of equal parts of amyl alc. and xylene, then through pure xylene (2 portions) in order to remove all traces of amyl alc., and are then mounted in xylene and Canada balsam. Amyl alc. has the advantage (over the  $Me_2CO$ -xylene mixts. of the Giemsa method) of not decolorizing preps. stained by the Romanovskii and derived (Giemsa, etc.) methods; even the most delicate tints are preserved. Amyl alc., even when kept in an open container, produces no turbidity with xylene and does not cause dimness of the preps., whereas the use of EtOH containing  $H_2O$  is subject to this objection.

H. S. PAINE.

Investigation, determination and excretion of arsenic in the urine. PAUL DURET. *Compt. rend. soc. biol.* 81, 736-7(1918).—Organic matter is first destroyed by action of  $NH_4$  persulfate in the presence of  $H_2SO_4$ . A qual. test for As is made by reducing the As compds. in this liquid with nascent H (Zn and  $H_2SO_4$ ) in a flask in the neck of which is inserted a filter paper impregnated with a 1:100 alc. soln. of  $HgCl_2$ ; the  $AsH_3$  evolved produces a yellow or brown color on contact with this paper. As is detd. quant. by placing the above liquid (after destruction of organic matter) in a Marsh app. and passing the  $AsH_3$  evolved into a  $HNO_3$  soln. of  $AgNO_3$ . The proportion of As in the original liquid is calcd. from the amt. of  $AgNO_3$  which is reduced, the amt. of  $AgNO_3$  reduced by a given wt. of As as  $AsH_3$  having been previously detd. In the case of syphilis patients who received successive injections of 0.30, 0.60, 0.75 and 0.90 g. of novarsenobenzol at 8-day intervals As appeared in the urine within 24 hrs. after the 1st injection. The capacity for renal elimination of As was not greater than 0.01 g. of As per 24 hrs. Each patient received injections of 2.55 g. of novarsenobenzol in all (slightly more than 0.50 g. of As) and during the 28 days of the expt. there was excreted in the urine approx. 0.10 g. of As or practically  $\frac{1}{8}$  of the amt. injected. No more As was eliminated in the urine 4 days after the last injection (0.90 g. of novarsenobenzol) than was excreted 4 days after the 1st injection (0.30 g. of novarsenobenzol).

H. S. PAINE.

Colorimetric determination of non-protein nitrogen of the blood by means of Nessler's reagent. A. GRIGAUT AND F. GUÉRIN. *Compt. rend. soc. biol.* 81, 1139-42 (1918).—G. and G. propose a method similar to the nesslerization method of Folin and Denis for detg. non-protein N in small amts. of blood, etc. Three to 5 cc. of serum, plasma, whole blood or erythrocytes are mixed with an equal vol. of 20:100  $CCl_4CO_2H$  and filtered after several mins. Two cc. of the filtrate, 1 cc. of  $H_2SO_4$ - $H_3PO_4$  mixt. (100 cc. 66° Bé.  $H_2SO_4$ , 300 cc. 60° Bé.  $H_3PO_4$ , 25 cc. 10:100  $CuSO_4$  soln.) and a piece of pumice stone are placed in a large test-tube and the non-protein N compds. are hydrolyzed by heating over a flame (certain precautions are prescribed); the total time required is about 5 mins. Allow the liquid to cool 2 mins., add distd.  $H_2O$ , transfer to a 100 cc. flask, dil. with distd.  $H_2O$  to 70-75 cc., add 13.5 cc. 10:100 NaOH soln. and 10 cc. Nessler reagent (containing 5-6:100 of  $HgI_2 \cdot 2KI$  and 3:100 of NaOH) and complete the vol. to 100 cc. with distd.  $H_2O$ . This soln. is compared colorimetrically with a standard soln. containing 0.8 cc.  $H_2SO_4$ - $H_3PO_4$  mixt., 13.5 cc. of 10:100 NaOH soln.

and (in normal cases) 25 cc.  $(\text{NH}_4)_2\text{SO}_4$  soln. in 100 cc. The  $(\text{NH}_4)_2\text{SO}_4$  soln. is prepd. by dissolving 4.716 g. pure  $(\text{NH}_4)_2\text{SO}_4$  in 1 l. of 0.2 N  $\text{H}_2\text{SO}_4$  soln. and dilg. 10 cc. of this soln. to 1 l.; it contains 0.01 mg. N per cc. Comparison of this method with the Kjeldahl procedure showed a variation of not more than 0.7 cg. per 1000 g. of material. This method may be adapted to the sp. detn. of protein, proteose, urea and  $\text{NH}_3$  N.

H. S. PAINE.

**Trypsin and a new method of purifying enzymes.** JOSEPH T. WOOD. *J. Soc. Chem. Ind.* 37, 313-57(1918).—W. repeated the expts. of Holzberg (cf. *C. A.* 7, 2233) by adding a 0.1% and also a satd. soln. of safranin to various infusions containing trypsin and subjecting the ppts. formed to the gelatin test. It is suggested that Holzberg removed some of the enzyme by washing the ppt. On repeating the expts. with a purer form of trypsin, containing but little albuminous matter, no ppt. was formed. Trypsin was purified by immersing disks of high-grade filter paper in the impure enzyme soln., then drying quickly in a current of hot air. When such paper is placed in water the enzyme dissolves in 15 to 20 min. to a clear soln. while the colloid matter adheres to the paper. It is not claimed that a pure enzyme is produced, but that about 35% of non-enzyme material has been removed from the original sample. The purified enzyme was inactive to polarized light.

L. W. RIGGS.

**Acidity of the urine.** E. AND E. PITTARELLI. *Revista critica di clinica medica* 19, 517 and 529(1918); *J. Am. Med. Assoc.* 72, 458.—The authors state that the acidity of the urine is not as simple as generally accepted. There are at least two acidities, one reacting to methyl orange and the other to phenolphthalein. The latter is const. but not the former. There is also a latent acidity which can be rendered evident by the addition of  $\text{HCHO}$ . The true acidity of the urine due to the free or semi-combined acids forms scarcely two-thirds of the acidity ordinarily estd. with litmus, etc. The other third is made up of salts of weak bases combined with weak acids. This proportion keeps quite const. and the true acidity of urine is always lower than the figures hitherto accepted as correct; it corresponds to an acid soln. N/30. To distinguish between real and apparent acidity equal vols. of urine are treated with  $\text{CaCl}_2$  to transform all of the phosphates to Ca salts. Phenolphthalein is added to one specimen and dimethylaminoazobenzene to the other and the specimens are made neutral with 0.1 N NaOH and 0.1 N HCl, resp. The alkali required for the first specimen corresponds to the sum of the free weak acids and the combined weak acids. The acid required for the second specimen corresponds to the weak bases combined with the weak acids and therefore also to these weak acids transformed into salts. The difference between the vols. of NaOH and HCl used corresponds to the free acids.

L. W. RIGGS.

**Preparations of mediums: new hydrogen-ion concentration method.** LYMAN J. STRONG. U. S. Army. *J. Am. Med. Assoc.* 72, 413(1919).—The methods of adjusting mediums to the alkalinity of the human tissues are discussed and objections stated to the various indicators employed. Phenolsulfonephthalein as an indicator has a fairly long end-point which is of the same alkalinity as the tissues, and has proved so reliable that other methods have been discarded. But two stock mediums are necessary, one fluid broth, the other solid agar. "Broth is prepd. from 1000 g. of minced lean beef and 1000 cc. of water which are infused in an ice box for 24 hrs., filtered through glass wool, heated to boiling 2 min. and again filtered through glass wool. Now are added peptone 10 g., NaCl 5 g., water up to 1000 cc. and the white of one egg. The mixt. is heated to a boil and filtered through glass wool until clear; a 1 cc. ampule of phenolsulfonephthalein is then added. About 5 cc. are poured into each of two test-tubes. To one test-tube a drop of any acid soln. is added; to the other a drop of NaOH soln. Then drop by drop are added HCl or NaOH until the color of about 5 cc. poured into a third

tube is between the color of the other two tubes. The H-ion concn. of the entire batch of medium will now be about  $p_H = 7.5$ . This is the same as that of av. human blood serum. Should a ppt. form it may be filtered again through glass wool." "The advantages of the methods are: No standard soln. is used; any soln. will do. Any tube that changes reaction can be told at a glance and discarded before inoculating. Growth always produces a change in color. Growth of all organisms is much faster and luxuriant. Much time is saved and there is a more desirable product." L. W. RIGGS.

**Action of ferric thiocyanate upon normal human serum.** ARTHUR VERNES AND ROGER DOURIS. *Compt. rend.* 167, 972-4 (1918); cf. *C. A.* 12, 915, 2009.—The reagent is prepd. by adding 0.25 g.  $NH_4CNS$  to 4 cc. of a soln. containing 20 cc. of  $FeCl_3$  soln., sp. gr. 1.26, and 150 cc. water, and the mixt. is made up to 250 cc. with water. In a series of 20 small tubes is distributed normal serum in amts. ranging from 0.4 down to 0.04 cc., each tube containing 0.1 less than the preceding and the vol. of the serum is made constant (0.4 cc.) by the addition of water. To each tube is added 0.8 cc. of the reagent. The reaction assumes a periodic character, and after agitation no ppt. is seen in the tubes containing the more concd. serum but appears in the following tubes, reaching a max. in about the tenth tube and decreasing to no ppt. in the tubes containing the most highly dild. serum. There is an accompanying decoloration which facilitates observation. The ppt. in the middle tubes is whitish, gelatinous and with certain serums remains in the tube on inversion of the latter. The results obtained in this study form a basis for comparison in the study of syphilitic and other abnormal serums.

L. W. RIGGS.

**Necessity for rapid estimation of the total acidity of gastric juice.** MAURIN. *Rept. pharm.* 29, 1-2 (1919).—Expts. showed that in gastric juice containing 1.65 per 1000 of total acidity at the time of evacuation, on standing the acidity increased as follows: 6 hrs., 1.94; 24 hrs., 2.18; 36 hrs., 2.34; 48 hrs., 2.56 parts per 1000. After 48 hrs. the acidity tends to diminish. The importance of an immediate detn. of the acidity for diagnostic purposes is evident, especially in cases of hypoacidity.

L. W. RIGGS.

## C. BACTERIOLOGY.

**Habituation of staphylococci to antiseptics in vitro and in vivo.** G. S. HARDE AND H. W. JACKSON. *Compt. rend. soc. biol.* 81, 635-7 (1918).—Strains of staphylococci freshly isolated from wounds (before treatment of the latter) were subjected to the action of 0.5:100 PhOH for 3 periods of  $1\frac{1}{4}$  hr. each and subsequently to the action of 1:100 PhOH for 3 periods of  $\frac{3}{4}$  hr. each, the bacteria being kept in culture between each treatment. The treated cultures resisted the action of 1:100 PhOH for  $1\frac{1}{2}$  hr., while the original, untreated cultures only resisted for  $\frac{3}{4}$  hr. On the other hand, staphylococci showed hypersensitiveness to Carrel-Dakin  $NaClO$  soln. after repeated contact with the latter. Staphylococci isolated from wounds which had been treated with Carrel-Dakin soln. for 24-55 days were subjected in culture to the action of different proportions of this antiseptic. Staphylococci isolated from wounds which had been treated 45, 52 and 55 days with Carrel-Dakin soln. were practically as sensitive to the antiseptic as those which were isolated from 2-day wounds (more sensitive in 1 instance). Unusual resistance (ascribed to individual peculiarities) was encountered in staphylococci in 2 instances (from 2- and 33-day wounds, resp.).

H. S. PAINE.

**Oxidation of lactic acid by bacteria with formation of pyruvic acid and ketone compounds.** P. MAZÉ. *Compt. rend. soc. biol.* 81, 1150-2 (1918).—M. reports the amts. of pyruvic acid produced at  $25^\circ$  in 4, 9, 16 and 32 days by 6 species of bacteria growing in a medium composed of a soln. of inorganic salts (cf. *C. A.* 11, 976, 2585) which was slightly alk. to phenolphthalein and to which 3 g. of Ca lactate per 100 cc. had been added. Pyruvic acid was detd. by a colorimetric method based on the Simon

reaction; preliminary distn. under reduced pressure was not required. This colorimetric method was applicable to detn. of pyruvic acid in concns. varying from 0.1:1000 to 1:1000. The rate of formation of pyruvic acid and the rate of its subsequent destruction varied greatly according to the species of bacteria concerned. The max. proportion of pyruvic acid observed was 5.020 g. per l. of culture. The amt. of lactic acid destroyed in 32 days varied from 0.24 g. to 7.26 g. per l., according to the species of bacteria; the amt. of AcOH produced in 32 days varied from traces to 2.280 g. per l. Formic acid was not encountered. In addition to pyruvic acid and AcOH 2 of the species of bacteria produced acetylmethylcarbinol and diacetyl while a 3rd species produced acetylmethylcarbinol but no diacetyl; the other 3 species produced only traces of these compds. Acetylmethylcarbinol is apparently produced by combined reaction and oxidation of lactic and pyruvic acids while diacetyl is doubtless formed by oxidation of pyruvic acid alone. It is also possible that diacetyl is formed directly from acetylmethylcarbinol by oxidation of the CHOH group, although this supposition is weakened by the absence of butyleneglycol (only traces of which were found in the cultures).

H. S. PAINE.

**Action of bile on dysentery bacilli.** S. MARBAIS. *Compt. rend. soc. biol.* 81, 1136-7(1918).—Disappearance of dysentery bacilli from the stools of patients was observed to coincide with the flow of bile to the intestinal canal. M. has, therefore, made expts. *in vitro* to det. whether bile exerts an injurious effect on dysentery bacilli. Ox bile heated at 120° was inoculated with a no. of strains of Shiga, Hiss and Flexner bacilli; after a certain period at 37° approx. 1 cc. of the bile was used to inoculate bouillon and gelose. Even 48 hrs. contact with bile failed to prevent growth of the Hiss and Flexner bacilli. Seven out of 14 strains of Shiga bacilli failed to yield a culture after contact with bile.

H. S. PAINE.

**New culture bouillon which is particularly suited to the development of pyogenic streptococcus.** LOUIS BOYER. *Compt. rend. soc. biol.* 81, 229-31(1918).—In view of the unusually abundant growth of pyogenic streptococcus in osseous tissue and bone marrow as shown by its persistence in infected fractures B. added org. and inorg. constituents of bone tissue to a no. of culture broths in an attempt to obtain a culture medium peculiarly suited to this bacillus; none of these were, however, distinctly superior to the usual media. Excellent results were finally obtained with a medium prepd. in the following manner: A mixt. of 500 g. crushed bones (preferably beef ribs), 100 cc. N HCl and 900 cc. H<sub>2</sub>O is allowed to stand 12-24 hrs., heated at 125-30° for 1½ hr., cooled, and filtered through cloth; peptone (15:1000) is added, the soln. is neutralized (without filtering) with dil. NaOH soln. to amphoteric reaction, heated at 125-30° for 1½ hr. and filtered while hot. The prepn. is kept in a cool place for 1 day to induce pptn. of Ca<sub>3</sub>HPO<sub>4</sub>; it is then filtered, distributed in tubes and sterilized at 120°. The hemolyzing power of the cultures was used as a criterion for detg. the suitability of the various media studied. The medium above-mentioned is also suitable for other bacteria constituting the aerobic flora of war wounds.

H. S. PAINE.

**Biochemical action of bacteria on sugars and alcohols.** A. BESSON, A. RANQUE AND CH. SENEZ. *Compt. rend. soc. biol.* 81, 930-3(1918).—The varying results which have been obtained with respect to the action of certain bacteria on sugars are due largely to the varying character of the media in which the sugars were incorporated. An attempt has been made to standardize the technic so that comparable results may be obtained. The authors have studied the action of the typhoid bacillus, *B. proteus*, *B. coli*, the cholera vibrio, paratyphoid A and B bacilli, pyocyanic bacillus and the Shiga, Flexner and Hiss bacilli on glucose, levulose, maltose, sucrose, lactose, dulcitol, mannitol and glycerol incorporated in (1) litmus and peptone gelose with meat bouillon and (2) 3:100 aq. peptone soln. The media contained 1.5 % of sugar or alc. Results were

noted after 24-48 hrs. incubation. *B. coli*, *B. proteus*, the paratyphoid A and B bacilli and the cholera vibrio attacked or failed to attack the 3 alcs. according to the medium in which the latter were incorporated. The data obtained warrant the following conclusions. The nature of the culture medium is of great importance and should be indicated whenever the action of bacteria on sugars and alcs. is reported. Glucose is the most readily attacked of the 8 compds. studied. No bacillus was found which attacked other sugars and alcs. and failed to attack glucose. Bacteria may attack sugars and polyatomic alcs. in 2 ways., *vis.*, (1) by decompn. into simpler compds. with formation of organic acids and without production of gas; (2) by production of both acids and gas ( $\text{CO}_2$ , H and small amts. of hydrocarbons). These 2 modes of attack are a sp. property of the bacillus and do not depend on the nature of the sugar or alc. A bacillus which attacks a sugar or alc. without formation of gas also acts in the same manner on all the sugars and alcs. which it attacks. A bacillus which attacks a sugar or alc. with evolution of gas likewise acts with formation of gas on all sugars and alcs. which it attacks. The fact that a bacillus attacks sugars with or without formation of gas is more important for fixing the character of the bacillus than mere detn. of the fact that the latter attacks certain sugars. Bacilli may be classified into 3 fundamental groups according to the following facts: (1) no action on sugars and alcs.; (2) attack without production of gas; (3) attack with production of gas. Commenting on the above, L. Martin points out that the use of an aq. meat ext. would not furnish a sufficiently definite medium for incorporation of sugars and alcs., since very fresh meat contains glycogen which may subsequently be transformed into glucose, thus introducing a complicating factor.

H. S. PAINE.

**Action of *Bacillus sporogenes* on certain carbohydrates and proteins of culture media.** E. VAUCHER AND F. GUÉRIN. *Compt. rend. soc. biol.* 81, 362-4(1918).—Various sugars and polyatomic alcs. were added to a medium prepd. by beating 2 egg whites in 330 cc.  $\text{H}_2\text{O}$ , adding 4 cc. of *N* NaOH soln., heating at  $95^\circ$  for  $1\frac{1}{2}$  hr., filtering and sterilizing. The sugars were added in the proportion of 1:100 and the cultures were examd. 24 hrs. after inoculation. All cultures were made in exhausted sealed tubes. Concordant results were obtained with all races studied. Glucose, levulose and maltose were attacked; this reaction was particularly distinct and rapid with glucose and maltose. Levulose was sometimes attacked more slowly by certain races of *B. sporogenes*; the resulting acidity was in general less when levulose was used. Lactose, sucrose and mannitol were never attacked; in the presence of these sugars the medium remained alk., even after several days. In all cases the pptn. or non-pptn. of albumin (due to production of acid) was a certain and sufficient index for detg. whether the sugar studied was or was not attacked. A 2nd medium was also employed; this was prepd. by finely mincing a beef heart (carefully freed from fat), adding an equal wt. of  $\text{H}_2\text{O}$ , heating at  $90^\circ$  for 1 hr., and rendering slightly alk. to litmus with NaOH. The proteolytic action of *B. sporogenes* on both the foregoing media was studied. These media contained before inoculation a certain proportion of syntonins and albumoses, but no trace of peptone. After inoculation there was a progressive decrease in syntonins and a parallel increase in peptones. This transformation was complete in 8-10 days and at the end of this period the protein substances of the medium consisted solely of peptones. Degradation of proteins followed the same course in both media.

H. S. PAINE.

**Study of vitamines utilizable in the culture of bacteria.** Application to the bacillus of influenza (*B. de Pfeiffer*). H. AGULHON AND R. LÉGROUX. *Compt. rend.* 167, 597-600(1918).—The idea of vitamines, hormones of growth, has been extended to microbiology by recent workers. The favoring action of blood, serum, ascitic fluid, etc., upon bacterial cultures is accounted for by the presence of vitamines of growth in

these liquids and not by the introduction of intact albumin into the cultures. To prep. exts. of the blood rich in vitamins the defibrinated blood was pptd. with four vols. abs. alc. which was allowed to remain in contact 30 min. and then removed by the centrifuge or filter. The ppt. was taken up with a vol. of physiol. saline soln. equal to that of the alc. used, allowed contact for one hr. with agitation, then filtered or centrifuged. These operations were made aseptically or the soln. was passed through the Chamberland F bougie. The soln. thus obtained is nearly colorless and is rich in vitamins. In a second method the defibrinated blood was treated with four vols. physiol. saline, heated 15 min. on the water bath at 80° with frequent agitation and filtered or centrifuged as in the first method. Solns. of vitamins obtained by either of these methods, when added to the usual culture media in amts. of 5 to 10%, promote the growth of *B. de Pfeiffer*. Even a 1% soln. showed positive results. Expts. seemed to prove that the vitamins are fixed in the cells and a destruction of these elements by alc., heat or otherwise sets them free in the aqueous liquid. They are probably insol. in alc. A cold alc. ext. of freshly washed cells was inactive, but when made at 80° was slightly active. Cold or warm acetone exts. were inactive. Heat to 80° in the presence of alc. or acetone followed by desiccation at a lower temp. did not destroy the vitamins, as they could be extd. with water from the powders thus obtained. Aqueous solns. of vitamins lose a part of their activity by heating 15 min. at 90°. This activity is more stable if the vitamins are in a gelose medium when a decrease is noted at 100° and total disappearance at 120°.

L. W. RIGGS.

Production of non-specific bactericidal substances by means of antistaphylococcic and antistreptococcic vaccines in vivo and in vitro. A. E. WRIGHT. *Compt. rend.* 167, 600-6(1918).—Nine vols. of human blood were dild. with one vol. physiol. salt soln. and one vol. staphylococcic vaccine. After 2.5 hrs. in the thermostat the serum of the blood was tested by inoculating with progressive dilns. of a staphylococcic or streptococcic mixt., and 12 to 14 hrs. later the results together with those of suitable controls were examd. microscopically. The expts. were repeated with varying periods of incubation and the results assembled in five tables. The expts. show that by a direct addition of vaccine of extravascular blood, a non-specific bactericidal substance may be produced. This depends primarily on the amt. of vaccine employed, also on the duration of incubation. The phenomena observed *in vitro* are largely paralleled and confirmed by expts. *in vivo*.

L. W. RIGGS.

Production of glycine by *Isaria densa*. MARIN MOLLIARD. *Compt. rend.* 167, 786-8(1918).—Old cultures of various bacteria or fungi on gelatin media frequently show groups of crystals. This is especially marked with cultures of *Isaria densa*. Upon sepn. and purification these crystals melted at 236° and gave several positive reactions for glycine including Sorensen's test in which the acidity was compared with that of an equal wt. of known glycine. Expts. proved that this action is not at all comparable to an acid or tryptic hydrolysis of protein material. If cultures of *I. densa* are grown on a medium containing sugar, the necessary minerals, and gelatin as the only nitrogenous constituent, there is a rapid development of the fungus, a progressive liquefaction of the gelatin, and at the end of 6 months, when the culture does not appear to undergo further modification, a large mass of crystals remains. These may be purified by fractional pptn. from alc. and yield 33% of the gelatin introduced. Hydrolysis of gelatin by acids yields only 16.5%. Fibrin, which gives 15% as leucine and 3% as glycine upon acid hydrolysis, yields 38% of glycine under the action of the mycelium of *I. densa*. Egg albumin, serum albumin and casein do not give glycine upon acid hydrolysis, but under the action of *I. densa* they yield 35, 30, and 32%, resp., of glycine. Parallel expts. with *Penicillium glaucum* gave no glycine with gelatin, egg albumin, or casein. With serum albumin no excess of crystals of glycine over acid



hydrolysis was produced, but crystals of leucine were formed. It is suggested that the culture of *I. densa* on gelatin be used as a method for the prepn. of glycine.

L. W. RIGGS.

Influence of certain conditions upon the comparative consumption of glucose and of levulose by *Sterigmatocystis nigra* on splitting of sucrose. MARIN MOLLIARD. *Compt. rend.* 167, 1043-6(1918).—The culture liquid employed consisted of sucrose 46.7 g.;  $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6$ , 9.2;  $\text{MgSO}_4$ , 0.8;  $\text{KH}_2\text{PO}_4$ , 0.8;  $\text{FeSO}_4$ , 0.046;  $\text{ZnSO}_4$ , 0.046;  $\text{H}_2\text{O}$  up to 1000 cc. The quantity of N in the culture medium was such that the  $\text{NH}_4$  and sugar disappeared from the liquid in the same time and the ratio of N to C was 1 to 16. If the ratio of consumption of the two sugars in this liquid is measured during the course of growth, it is seen that glucose is used much faster at first, but its use rapidly decreases and the two sugars co-exist up to their complete utilization. The wt. of dry mycelium obtained from 150 cc. of the nutritive medium was about 4 g. If the  $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6$  was replaced by  $\text{NH}_4\text{NO}_3$  or by  $\text{NH}_4\text{Cl}$ , still keeping the ratio of N to C 1 to 16, similar results were obtained. In case of  $\text{NH}_4\text{Cl}$  with the ratio of N to C 1 to 32 the yield was 2.9 g. of mycelium in 4 days instead of 4 g. in 3 days. Upon adding varying amts. of HCl (e. g., 290 or 310 mg.) to 150 cc. of the nutritive liquid the consumption of glucose was increased, ranging from 2.39 to 6.97 times that of levulose. All the glucose had disappeared on the 21st day, while more than half of the levulose remained. The results of this study appear to support the ideas of Lindet (cf. *C. A.* 5, 2664) that levulose contributes principally to the formation of tissue.

L. W. RIGGS.

Bacterial changes in latex (WHITBY) 30.

#### D. BOTANY.

CARL L. ALSBERG.

Hardening process in plants and developments from frost injury. R. B. HARVEY. Bur. Plant Industry, U. S. Dept. Agr. *J. Agr. Research* 15, 83-113(1918).—Cabbage plants kept at  $+3^\circ$  for 5 days were resistant to freezing when kept at  $-3^\circ$  for 5 hrs. and were found to have an increased  $P_H$  and an increase in salt concn. although neither of these factors was sufficient to account for the lower f. p. There was also an increase in amino N which would indicate that the proteins have undergone a change rendering them more difficult to ppt. Upon freezing, the juices of "non-hardened" cabbage were found to have the protein more completely pptd. than was the case with the juice of "hardened" cabbage, and the  $P_H$  of the former was also higher. The tumors resulting from freezing also contained juice which exhibited a higher  $P_H$ . R. N. HARGER.

Contributions to our knowledge of plant sterols. I. The sterol content of wheat (*Triticum sativum*). M. T. ELLIS. *Physiol. Lab., Univ. London. Biochem. J.* 12, 160-172(1918); cf. *C. A.* 12, 2614.—The phytosterols in different organs of wheat plant were examd. The chief phytosterol present in the grain—sitosterol—was found to be the same as that in the embryo. Bran contains a phytosterol, but its m. p. differs from that of sitosterol. With vegetative organs an alc.,  $\text{C}_{26}\text{H}_{48}\text{O}$ , which did not give the phytosterol color reactions, and did not combine with digitonin, and an oil were isolated. The quantity of phytosterol in normal wheat plant is greater than that in the grain. In the embryo the percentage of phytosterol is greater than in the plant.

II. Occurrence of phytosterol in some of the lower plants. *Ibid* 12, 173-7(1918).—Ergosterol and fongisterol were isolated from the fungus *Polyporus nigricans*. The evidence tends to show that in lower plants the sterols may occur in non-cryst. form.

B. HARROW.

Blister canker of apple trees; a physiological and chemical study. DEAN H. ROSE. *Bot. Gaz.* 67, 105-46(1919).—This is a continuation by R. of an earlier investigation on the oxidase activity of healthy and diseased bark (*C. A.* 9, 2396). The oxidase ac-

tivity of diseased bark is greater than that of healthy bark. H-ion concn. of diseased bark ( $P_n = 5.61$ ) is less than that of healthy bark (5.15). In general, the more severely the bark is attacked by the fungus the greater is its catalase activity. The catalase activity is to some extent in indirect ratio to oxidase activity. B. H.

**The sulfur requirement of the red clover plant.** W. E. TOTTINGHAM. Univ. Wis. *J. Biol. Chem.* 36, 429-37(1918).—A study was made of the response of the common red clover plant to different forms and planes of S supply; the seedlings were grown in  $H_2O$  cultures using Knop's nutrient soln. and in sand cultures irrigated with a renewed nutrient soln. "For these exptl. conditions, between 0.1 and 0.01 of the usual amt. of  $MgSO_4$  of Knop's soln. was as efficient as the usual amt. for the growth of red clover, when the balance of the  $MgSO_4$  was replaced by  $Mg(NO_3)_2$ . The yield of dry tops of this plant was only  $1/4$  to  $2/3$  as great with  $MgSO_4$  wholly replaced by  $Mg(NO_3)_2$ , as with unmodified Knop's soln. Addition of  $Na_2SO_4$  and  $CaSO_4$  to the S-free modification of Knop's soln., in amts. equiv. to the S of the unmodified soln., produced yields of dry tops superior to those of the latter soln. In this respect  $CaSO_4$  was very efficient. In view of the fact that all of the nutrient media which supplied S were liberally supplied with Ca, it appears that  $CaSO_4$  had peculiar efficiency as a mol. complex, and that the S of this salt functioned in the mol. combination in which it was supplied. The more or less parallel fluctuations of the plane of S supply, wt. of N assimilated, and yield of dry tops, of these clover plants, indicate that a deficiency of S supply restricted growth by limiting the synthesis of protein." A. P. LOTHROP.

**Do seedlings reduce nitrates?** J. DAVIDSON. U. S. Dept. Agr., Bur. Chem. *J. Biol. Chem.* 37, 143-8(1919).—Growing seedlings do not, as a part of their metabolic processes, reduce the nitrates in the medium in which they are growing. Positive results reported by previous investigators were no doubt obtained because of insufficient precautions to guard against bacterial contamination. A. P. LOTHROP.

**The withering of pitch-firs (Epicea) in the valley of the Arve (Chedde and Chamonix).** MANGIN, VINCEY, HALLER AND HENNEGUY. *Compt. rend. acad. agr.* 5, 113-5(1919).—A discussion. At Chedde this phenomenon is due to HCl formed from Cl liberated in the manuf. of chlorates and perchlorates. The zone of the action of noxious gases and fumes from Paris includes the forest of Boulogne, which accounts for the withering of the pitch-firs here as these trees are extremely sensitive. This zone is clearly limited by the disappearance of mosses and lichens from the trunk of trees. Cf. following abstr. ALBERT R. MERZ.

**The withering of the pitch-firs (Epicea) in the valley of the Arve (Chedde and Chamonix).** L. MANGIN. *Compt. rend. acad. agr.* 5, 195-204(1919).—In the region of Chamonix this is a physiological disease of uncertain origin though probably due to lack of atm. humidity. Cf. preceding abstract. ALBERT R. MERZ.

**Linaria (L. minor Desf.) containing hydrocyanic acid.** MÉDÉRIC GARD. *Compt. rend. soc. biol.* 81, 621-2(1918).—G. has detected a cyanogenetic compd. in *Linaria minor* Desf. by the usual method of maceration, digestion and distn.; 100 g. of the fresh plant contained 0.0583 g. HCN (detn. by Liebig-Denigès method) as compared with 0.0147 g. in the same wt. of *L. striata* D. C. (found by Bourquelot). Plants in full bloom were used for the analysis. H. S. PAINÉ.

**The physiological basis of morphological polarity in regeneration.** I. JACQUES LOEB. *J. Gen. Physiology* 1, 337-62(1919); cf. *C. A.* 12, 1206, 2343.—The two apical leaves of the plant, *Bryophyllum calycinum*, suppress shoot formation in all the dormant buds situated basally from them. Each apical leaf suppresses shoot formation in that half of the stem to which its petiole is attached. When one-half of the petiole of such a leaf is removed, the growth of basal buds in one quadrant of the stem is suppressed.

This inhibitory action of a leaf is diminished or disappears when the mass of the leaf is reduced below a certain limit. When stems are suspended horizontally, the inhibitory influence of an apical leaf is greater when the leaf is on the upper than when it is on the lower side of the stem. It is suggested that the leaf secretes a substance having an inhibitory influence upon shoot formation and that this substance is carried by the sap from the leaf towards the base of the stem. An apical leaf accelerates root formation in the basal part of a stem, the effect increasing with the mass of the leaf. The influences of the leaf upon shoot and root formation are factors determining the polar character of regeneration.

CHAS. H. RICHARDSON.

A comparative study of permeability in plants. W. J. V. OSTERHOUT. *J. Gen. Physiology* 1, 299-304 (1919).—Quant. studies on the permeability of the algae, *Laminaria*, *Ulva*, *Rhodomenia*, and of a flowering plant *Zostera*, showed a marked agreement in all cases. Permeability was measured by detg. the elec. resistance of the plant tissues in solns. of NaCl, CaCl<sub>2</sub>, BaCl<sub>2</sub>, SrCl<sub>2</sub>, MnCl<sub>2</sub>, NiCl<sub>2</sub>, (K<sub>2</sub>SO<sub>4</sub>.Al<sub>2</sub>(SO<sub>4</sub>)<sub>2</sub>.24H<sub>2</sub>O), Ce(NO<sub>3</sub>)<sub>3</sub>, La(NO<sub>3</sub>)<sub>3</sub>, Et<sub>2</sub>O, CHCl<sub>3</sub>, EtOH or in combinations of them.

CHAS. H. RICHARDSON.

Relation of the plant to the reaction of the nutrient solution. D. R. HOAGLAND. Calif. Exp. Sta. *Science* 48, 422-5 (1918).—Previous expts. with barley seedlings (cf. *C. A.* 11, 2819) grown in various potassium phosphate solns. indicated a strong tendency on the part of the plant to change either acid or alk. culture media in the direction of neutrality. Extension of these expts. was made by growing barley to maturity in other solns., including complete nutrient solns., observations being made at all stages of growth. Also several varieties of beans were grown. Sand and water cultures were used, the technic being such as to insure normal well matured plants. Even with plants grown to maturity without change of soln., the neutral reaction remained constant throughout the entire period. H-ion concn. was usually detd. as described by Clark and Lubs (cf. *C. A.* 11, 1443, 3288). Chem. analysis of the solns. proved that the change in reaction had been the result of selective absorption from the various phosphoric anions accompanied by an equiv. removal of positive ions. Barley plants grown 7 weeks in favorable nutrient solns. were transferred (after thoroughly washing the roots with distd. water) to solns. of KCl, K<sub>2</sub>SO<sub>4</sub>, MgSO<sub>4</sub>, K<sub>3</sub>PO<sub>4</sub>, NH<sub>4</sub>Cl and NaNO<sub>3</sub>. The reactions of the solns. were tested after periods of contact varying from a few hrs. to 40 days. In no case was excessive H- or OH-ion concn. produced. The change in the K<sub>3</sub>PO<sub>4</sub> soln. was striking in that from an intense alkalinity the soln. became approx. neutral. NH<sub>4</sub>Cl soln. retained an acid reaction. Analysis showed a considerable absorption of both ions but about 5% more NH<sub>4</sub> than Cl was removed. The balance was restored by the excretion from the plant of equiv. quantities of other bases, chiefly Ca. After boiling, the NaNO<sub>3</sub> soln. gave an OH-ion concn. similar to that produced by the hydrolysis of Na<sub>2</sub>CO<sub>3</sub>. Apparently part of the NO<sub>3</sub> was removed simultaneously with an equiv. quantity of Na but more NO<sub>3</sub> than Na was absorbed, HCO<sub>3</sub> ion entering or being formed in the soln. to restore the balance. This ion in equil. with dissolved CO<sub>2</sub> brought about a neutral reaction in the soln. actually in contact with the plant. From KCl solns. K and Cl were absorbed in equiv. quantities. A study of Calif. peat soils showed them to be decidedly acid yet containing from 100 to 3000 p. p. m. NO<sub>3</sub> (basis of dry soil). The acidity did not interfere with the production of good crops of beans, potatoes and corn, nor with the production of nitrates.

L. W. RIGGS.

Mitochondrial origin of the plastids. A. GUILLIERMOND. *Compt. rend.* 167, 430-5 (1918).—This paper presents a discussion of the theory, supported by Rudolph, Scherrer, and Sapehin, and which has recently been advanced by Mottier, that the plastids are formed independently of the mitochondria. G. maintains that the plastids

proceeding from the differentiation of mitochondria are identical with those of the animal cell. This conclusion is sustained by the recent comparative studies of Cowdry upon the chondriome of the pea root and of the pancreas of mice. L. W. RIGGS.

**Distribution of mineral elements and of nitrogen in etiolized plants.** G. ANDRÉ. *Compt. rend.* 167, 1004-6(1918); cf. Maquenne and Demoussy, *C. A.* 11, 2817, 2922. —One hundred and eleven seeds of white haricot, weighing 130 g., were planted on July 5 in a darkened bed of Fontainebleau sand which had been previously treated with acids, water and heat. The bed was watered daily. On July 30 the etiolized plants were in good condition with no trace of moldiness and with a length of stems from 30 to 35 cm. The plants were removed, the roots washed, and the cotyledons sepd. from the roots and stems. The wts. of 100 fresh seeds, cotyledons, roots and stems were 117.1, 97.0, and 346.84 g., resp., and on drying each at 110° the percentages of water were 13.81, 67.50, and 88.89, resp. The distribution and translocation of various elements, as detd. by chem. analysis, are shown in the following table:

|                         | N.<br>g. | CaO.<br>g. | MgO.<br>g. | K <sub>2</sub> O.<br>g. | P <sub>2</sub> O <sub>5</sub> .<br>g. | SO <sub>3</sub> .<br>g. |
|-------------------------|----------|------------|------------|-------------------------|---------------------------------------|-------------------------|
| 100 fresh seeds.....    | 2.937    | 0.222      | 0.287      | 2.039                   | 0.983                                 | 0.656                   |
| 100 cotyledons.....     | 0.791    | 0.148      | 0.154      | 0.782                   | 0.256                                 | 0.211                   |
| 100 roots and stems.... | 2.129    | 0.077      | 0.135      | 1.045                   | 0.662                                 | 0.463                   |
|                         | 2.920    | 0.225      | 0.289      | 1.827                   | 0.918                                 | 0.674                   |
| % in cotyledons.....    | 27.11    | 65.77      | 53.38      | 42.80                   | 27.87                                 | 31.34                   |

L. W. RIGGS.

**Chlorophyll inheritance in maize.** E. W. LINDSTROM. Cornell Agr. Expt. Sta., *Memoir* 13, 68 pp.(1918).—The inheritance of 8 chlorophyll types is shown to be strictly mendelian.

J. J. SKINNER.

#### E. NUTRITION.

PHILIP B. HAWK.

##### ABNORMAL.

**Mineral metabolism in experimental acidosis.** KINGO GOTO. Rockefeller Inst. *J. Biol. Chem.* 36, 355-76(1918).—The effect of prolonged administration of acid on the mineral compn. of bones and muscles and on the excretion of phosphates in the urine has been studied. Rabbits were used rather than dogs because they form  $\text{NH}_3$  much less rapidly than dogs and would therefore be expected to neutralize unusual amts. of strong acid only by means of the reserves of alkali in the body fluids, tissues and skeleton. From 25 to 75 cc. of 0.25 *N* HCl were administered daily for 1 to 4 weeks; most of the rabbits showed a poor resistance to HCl and died usually within 1 to 2 weeks if more than 25 to 30 cc. were given. A reduction in the plasma bicarbonate occurred accompanied by an increased phosphate excretion which in some cases was followed by a fall. The phosphate excretion in the feces was not decreased. There was a marked loss of P and K by the muscles and a less marked decrease in Na. The chief effect on the skeleton was a great reduction in the fat content, from 17.1 to 8.6% of the dry wt. The skeletons of the acid-fed rabbits also averaged about 10% lighter than the control animals but there was no demonstrable loss of  $\text{Ca}_3(\text{PO}_4)_2$ . A definite loss of about 20% of the  $\text{CO}_2$  indicated that  $\text{CaCO}_3$  is more readily sacrificed in acid intoxication than  $\text{Ca}_3(\text{PO}_4)_2$ . "The individual variations in muscle and bone are such that in every constituent detd. the figures for some of the acid-fed rabbits overlap the normal range. Consequently the interpretation of results is not so sharp as could be desired. The results, nevertheless, indicate with a fair degree of decisiveness that next to the bicarbonate of the body fluids, the first major reserves of alkali drawn upon in acid intoxication of rabbits are the alk. phosphates, particularly K phosphate of the muscles, and

the  $\text{CaCO}_3$  of the bones. The results are only suggestive in their relationship to clinical acidosis. Whether the loss of alk. phosphates from the tissues and  $\text{CaCO}_3$  from the bones occurs in the latter remains to be ascertained by accurate detn. of mineral balances."

A. P. LOTHROP.

**Studies in the metabolic changes induced by the administration of guanidine bases.** V. The change of phosphate and calcium content in serum in guanidine tetany and the relation between the calcium content and sugar in the blood. C. K. WATANABE. Yale Med. School. *J. Biol. Chem.* 36, 531-46(1918); cf. *C. A.* 12, 2017. —The normal content of phosphate in normal rabbits is from 2 to 4 mg. per 100 cc. of serum, the amt. varying with the condition, the environment and the food of the animal. An amt. above 4 mg. indicates a condition of acidosis. After injection of guanidine hydrochloride an increase occurs in almost all cases, reaching as high as 5 times the normal amt. The normal Ca content of rabbit blood varies from 11 to 13 mg. per 100 cc.; it usually decreases in guanidine tetany; the decrease is not as marked as is the increase in phosphate. Under normal conditions the ratio of Ca to phosphate varies from 5.7 to 1.9, but decreases after guanidine injection to 2.8 to 0.5. The change of phosphate and Ca is not distinctly parallel, the phosphate change being the preliminary change and the Ca decrease or restoration a secondary phenomenon following acidosis. After injections of large doses of guanidine a hypoglycemia and an increased phosphate content are observed with or without a diminution of Ca in the same samples of blood. When small doses are injected at intervals there is no change in the sugar content even when the Ca is diminished to  $\frac{1}{2}$  the normal value. The low Ca is accompanied by a high phosphate content. These facts would indicate "that Ca is not concerned in the direct control of carbohydrate metabolism in guanidine poisoning but that some other intermediary metabolic change plays a part in this phenomenon. The hypoglycemia is accompanied by acidosis." The condition of severe acidosis with retention of phosphates, a decrease of Ca in the blood and a hypoglycemia are observed in parathyroid tetany as well as in guanidine tetany and the symptoms and all other physiological conditions are similar in both types. Large increases in guanidine bases have been found in parathyroid and idiopathic tetany and "it is possible that the fundamental cause of tetany is the increased formation of guanidine N brought about by the disturbance of the function of the parathyroid." The injection of sol. Ca salts temporarily relieves the tetany by replacing the Ca of the tissues and blood which has been inactivated or pptd. and excreted, and thereby reduces the excitability of the nerves. The mechanism for bringing about the diminution of the Ca in the blood and tissues may be attributed to the acidosis.

A. P. LOTHROP.

**Study of the metabolism in multiple exostoses.** VERNON K. KRIEBLE AND OLAF BRUGEM. Jefferson Med. College and McGill Univ. *J. Biol. Chem.* 37, 179-85 (1919).—A metabolic study was made of a case of multiple exostoses in which there were a number of bony growths on the lower ends of the radius and ulna and on the inner sides of the ankles, also a thickening of the digits with a tendency to dislocation due to atrophy of ligaments. There is apparently no relation between this disorder and rickets, nor is it due to any primary disturbance of general metabolism. There was a loss of N due in part, at least, to a hypermotility of the intestine as the patient was also suffering from a gastrointestinal disturbance. Retention of S was attributed to storage in the growing cartilage. The retentions of P, Ca and Mg were within normal limits as were also the % excretions of these elements in the urine.

A. P. LOTHROP.

**Creatinuria and acidosis.** W. DENIS AND A. S. MINOT. Mass. General Hosp. *J. Biol. Chem.* 37, 245-52(1919).—Although D. has obtained evidence in favor of the protein theory of creatine origin and has shown that the amt. of creatine present in

urine can be increased or decreased at will by changes in the protein content of the diet, it seemed desirable to carry out on human subjects a few expts. on the influence of acidosis along the same general lines used by Underhill (*C. A.* 10, 3096) in work on rabbits. It was found impossible to administer HCl to human subjects in amts. sufficiently large to make the expts. in any way comparable to those of Underhill so that a reverse procedure was adopted in which the subjects were fed a highly acid diet, and after creatine excretion was established  $\text{NaHCO}_3$  was administered in amts. sufficient to keep the urine alk. to litmus. The subjects were 2 normal boys, 2 normal women and 4 women suffering from hyperthyroidism. "On the whole the exptl. results presented appear to demonstrate no definite connection between changes in acid-base equil. and creatine excretion in human beings." In Underhill's work with rabbits creatine excretion was produced by a highly acid diet and decreased to the vanishing point in a diet of an alk. nature; administration of HCl promptly brought about creatine excretion, which continued as long as the acid administration was kept up. A. P. LOTHEROP.

#### F. PHYSIOLOGY.

ANDREW HUNTER.

The role of the thymus in pediatrics. MURRAY B. GORDON. *Endocrinology* 2, 405-19(1919).—An "unprejudiced review" with bibliography covering "the past few years." E. J. C.

Researches on the genesis of thiocyanic acid in animals. V. Influence of feeding on the elimination of urinary thiocyanic acid in the dog. SERAFINO DEZANI. Univ. Torino. *Arch. farm. sper.* 25, 278-88(1918); cf. *C. A.* 12, 2091.—The elimination of urinary HCNS depends upon the nature of the food. On changing from a food poor in N to one rich in N, the urinary HCNS is doubled in 24 hrs. Increasing the amt. of purines or their precursors in the food, however, had little or no effect. The formation of HCNS from HCN liberated from nitriles ingested is not a function of the kidney. A. W. DOX.

The newest "hormone." SWALE VINCENT. Winnipeg. *Endocrinology* 2, 420-9 (1918).—The depressor activity of exts. of lymphatic glands as found by P. Marfor (*Sur la fonction hormonique des ganglions lymphatiques. Arch. Ital. d. Biol. (Pisa)* 68, 113-27(1918)) is no evidence of the elaboration of a "hormone" and does not justify the use by M. of the term "lymphogangline" as applied to the active principle in the exts., which "it is to be hoped will not find any place in the literature." F. S. HAMMETT.

Galactischia: the hypodermic injection of mother's milk as a galactagogue. J. H. WILMS. *J. Am. Inst. Homeopathy* 11, 884(1919).—An abundant secretion of milk was produced by several successive injections hypodermically of small amts. (3 to 15 minims) of her own milk into a mother who was secreting practically no milk. JOSEPH S. HERBURN.

Contribution to the physiology of phosphorus and calcium metabolism as related to milk secretion. EDWARD B. MEIGS, N. R. BLATHERWICK AND C. A. CARY. U. S. Dept. Agr., Bur. Animal Ind. *J. Biol. Chem.* 37, 1-75(1919).—A study has been made of the concn. of certain substances in the blood, particularly P and Ca, but also other constituents, in an endeavor to discover the precursors in the blood of the various constituents of milk. The blood and plasma analyzed were obtained from the jugular or from the abdominal subcutaneous vein of intact normal or nearly normal cattle, the samples being obtained by means of a small trochar and cannula inserted through the skin into the vein. "Normal blood plasma contains no phosphorized proteins, and probably no P compds. at all except phosphatides and inorg. phosphates. The P of these two classes of compds. certainly comprizes more than 97% of all that exists in

normal plasma. The precursor in plasma of milk fat and milk P is phosphatide—either lecithin or some related body. The concn. of Ca in the plasma of cows is almost const. Small variations can be induced by varying the amt. supplied with the rations, but the chief controlling factor is probably the concn. of bicarbonate in the plasma. It is probable that the concn. of Ca tends to vary inversely with that of the bicarbonate. The concns. of phosphatide and of inorg. phosphates in the plasma are highly variable. Both can be made to vary by changing the amt. of P supplied with the rations, though the variations induced in this manner show themselves most markedly in the inorg. phosphate. Both undergo variations as the accompaniment of increasing age and of the later stages of pregnancy. The phosphatide of the plasma shows a marked tendency to rise during the 1st month of lactation and to remain high until lactation has ceased. This phenomenon is largely independent of the diet, and is thought to be connected with the fact that near the beginning of lactation there is a tendency for the body fat to be released from its stores and thrown out into the blood." From the results of their own expts. and the work of other investigators, the authors have formulated the following hypotheses regarding P and fat metabolism "though they cannot yet be regarded as definitely established." P from the digestive tract reaches the general circulation only in the form of inorg. phosphate and the phosphatides are synthesized from this inorg. phosphate and triglycerides. All org. P compds. are manufactured within the cells in which they are found and phosphorized proteins are not transported by the plasma from one fixed cell in the body to another. Many of the tissues and organs of the body of which the mammary gland and the muscles are conspicuous examples can receive their fat and P from the blood only in the form of phosphatide.

A. P. LOTHROP.

The physical properties and chemical composition of human amniotic fluid. DOKO UYENO. Kyoto Imp. Univ. *J. Biol. Chem.* 37, 77-103(1919).—Amniotic fluid from women in labor was obtained by a procedure which practically precluded contamination. It is a slimy, yellowish white or pale yellow fluid, cloudy like soap water and has a peculiar odor. It almost always contains much mucus and was filtered through four-fold gauze and later with suction before being used in the expts. Sp. gr. 1.0078 (av. 23 specimens); f. p. ( $\Delta$ ) 0.46 to 0.565°, av. 0.504°; osmotic pressure, 5.536 to 6.8, av. 6.072 amts.; sp. elec. cond., 119.06 to  $134 \times 10^{-4}$ , av.  $127.15 \times 10^{-4}$ ; H ion concn.,  $0.2266 \times 10^{-8}$  to  $0.2648 \times 10^{-7}$ , av.  $0.1282 \times 10^{-7}$ ; reaction, slightly alk.; it is nearly optically inactive after removal of the albumin by coagulation. The fluid always contains Cl, CO<sub>3</sub>, SO<sub>4</sub>, PO<sub>4</sub>, Na, K, Ca, Mg and Fe. The amts. of Cl, PO<sub>4</sub>, K, Na, Ca, and Fe are nearly const. The amt. of NaCl averages 75.2% of the total ash. A part of the H<sub>2</sub>SO<sub>4</sub> in the ash comes from the S of the albumins and a very small amt. is in the form of ethereal sulfates. The amt. of sulfates in the ash is therefore dependent on the amt. of albumin in the fluid. *D*-Lactic acid is a const. constituent and varied in 10 cases from 0.0336 to 0.1355%, av. 0.0726%. The fluid is sugar-free. It was impossible to demonstrate the presence of purine bases, choline, or monoamino-acids, even when 3000 cc. of amniotic fluid were examd. Histidine, lysine and allantoin are present in very small amts., but the presence of arginine is uncertain. Coagulable albumins are always present (av. 0.226% including mucin) and globulin occurs in traces. The amt. of mucin is too small to be quant. detd. Peptones and albumoses are absent. The av. amt. of NH<sub>3</sub> is 0.0029%, and of urea, 0.0323%, both making up about 70% of the so-called rest N. Uric acid and creatine are present in very small amts., but no creatinine or hippuric acid was found. Cholesterol is obtained on extrn. with Et<sub>2</sub>O.

A. P. LOTHROP.

Urea formation by the placenta. FREDERICK S. HAMMETT. Harvard Med. School. *J. Biol. Chem.* 37, 105-12(1919).—Urea increases in amt. from day to day

in a watery suspension of pulped placenta tissue kept in glass bottles in the presence of  $\text{CHCl}_3$  and  $\text{C}_7\text{H}_8$ . "The processes leading up to this product are in question. It may be simply a splitting of the urea residue from arginase, or it may be a heightening to determinability of the usual processes taking place in extrauterine life, whose course from deaminization, through  $\text{NH}_4$  carbamate, to urea, is fairly well established. Whatever the source of the urea formed by placenta tissue, these results give evidence that this organ as well as being excretory in function is also actively concerned in the prep. of the nitrogenous by-products of the fetus for excretion. It is our present idea that the fetus is able only faintly, if at all, to perform for, of, or by itself the functions of prep. its nourishment in assimilable form, or of breaking down its by-products into compds. ready for excretion; and that the placenta is interposed between mother and fetus to remove as far as possible these extra burdens from the maternal organism. These questions can obviously be settled only by continuation of the study of the biochemistry of placenta and fetal tissues."

A. P. LOTHROP.

**Comparative distribution of urea, creatinine, uric acid, and sugar in the blood and spinal fluid.** VICTOR C. MYERS AND MORRIS S. FINE. N. Y. Post-Graduate Medical School and Hosp. *J. Biol. Chem.* 37, 239-44(1919).—"Comparative analyses of blood and spinal fluid are reported on 15 cases, showing varying degrees of N retention. The concn. of urea in the spinal fluid averaged 88% of that of the blood, the concn. of creatinine 46%, that of uric acid 5%, and that of sugar 57%. These % differences represent the order of their soly. in  $\text{H}_2\text{O}$ , and apparently also the order of their diffusibility through the various tissues and membranes."

A. P. LOTHROP.

**Antitoxic action of the liver with respect to blood sera and uremic sera in particular.** HENRI BÉNARD AND RENÉ PANNIER. *Compt. rend. soc. biol.* 81, 628-30(1918).—Sera of patients with uremia, arteriosclerosis and aortitis (urea content of the blood = 0.27-4.17 g. per l.) were injected into (1) the marginal vein of the ear and (2) one of the mesenteric veins of rabbits at the rate of 1 cc. per min. until death ensued; the vol. of serum per kg. wt. of animal required in (2) was 1.6-4.6 times greater than that required in (1). The antitoxic action of the liver was also shown *in vitro* by injecting into the marginal vein of the ear of rabbits (1) the natural toxic serum, (2) the toxic serum after 1 hr. contact with  $\frac{1}{2}$  of its wt. of macerated rabbit kidney and (3) the toxic serum after 1 hr. contact with  $\frac{1}{2}$  of its wt. of macerated rabbit liver. The vol. of serum required to produce death was greater for (3) than for (2) and greater as a rule for (2) than for (1). The results show that the liver exercises a pronounced antitoxic action with respect to the toxic substances of blood serum and especially with respect to those of uremic serum.

H. S. PAINE.

**Parathyroids and calcium metabolism.** EDUARD UHLENHUTH. *J. Gen. Physiology* 1, 315-22(1919).—The thymus gland excretes a tetany-producing substance which is antagonized by the parathyroids. In parathyroidectomized mammals or in salamander larvae (which do not possess parathyroids) this substance may reduce the Ca content of the organism; it also has a highly injurious effect on the central nervous system resulting in permanent spasmodic muscular contraction and paralysis of almost the entire muscular system. The muscular contractions were prevented in these expts. by the introduction of Ca and Mg salts (as lactates) into the body, but nothing was found which would antagonize the tetany toxin and thus prevent the lesions of the central nervous system. The most important function of the parathyroids is to prevent tetany toxin from reaching the central nervous system by antagonizing it.

CHAS. H. RICHARDSON.

**Study of the pigments of blood serum.** G. PATEIN. *J. pharm. chim.* 18, 225-38 (1918).—P. reviews the methods of Gmelin-Hayem for the detection of biliary pigments in blood serum, and the procedure adopted by Gilbert, Herscher and Posternak



(1903), then Grimbirt's, finally Fouchet's methods (*C. A.* 12, 916). He extends the latter by sepg. the blue ppt. after 30 min. exposure to air, by centrifuging and washing with 10 cc. of 0.6% NaCl soln. in which it is insol. The blue ppt. yields part of its color to a 95% EtOH-CHCl<sub>3</sub> mixt., the less so, the more prolonged the contact with the reagent. It is sol. in Na<sub>2</sub>CO<sub>3</sub>; after filtering off Fe(OH)<sub>3</sub>, HCl causes a gray-blue ppt. In oxidizing bilirubin in CHCl<sub>3</sub> soln. by dil HNO<sub>3</sub> (1:4) P. holds the characteristic blue color by sepg. the blue CHCl<sub>3</sub> soln. from HNO<sub>3</sub>, stirring with dil. Na<sub>2</sub>CO<sub>3</sub> soln. and acidifying with CCl<sub>3</sub>CO<sub>2</sub>H. With amyl alc. in place of CHCl<sub>3</sub>, oxidation stops at biliverdin regardless of duration of contact, even at higher concn. of the acid. Under conditions under which the tests for bile pigments are carried out, indoxyl and indole if present do not interfere. P. also finds in blood serum very small amts. of a new *blue pigment, acetoglobulin*. To obtain it, dil. 100 cc. of human blood to 1 l., then add AcOH drop by drop until distinctly acid to litmus. After several hrs. sep. by centrifuging. A sediment is formed of blue tint, insol. in H<sub>2</sub>O, EtOH, Et<sub>2</sub>O, CHCl<sub>3</sub>. Centrifuged with 0.6% NaCl soln. The blue color dissolves and the residue is white. The blue liquid forms a white coagulum and a colorless liquid at 60 to 80°. Two vols. of 90% EtOH ppt. the blue liquid with blue insol. color; the liquid is colorless.

S. WALDBOTT.

### G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**Diet as a preventive of cancer.** H. L. NORTHERP. *Hahnemannian Monthly* 54, 34-41(1919).—A discussion of the relation of the mineral content of the diet to the causation and prevention of cancer.

JOSEPH S. HEPBURN.

**Anaphylaxis and its relations to some diatheses common to infancy and childhood.** FREDERICK W. SCHLUTZ AND W. P. LARSON. *Univ. Minn. Arch. Pediatrics* 35, 705-13(1918).—Blood (3 to 5 cc.) was drawn from the patient, permitted to clot, and centrifuged; the vol. of serum obtained was approx. one-half that of the blood taken. The serum was injected intravenously or intraperitoneally into guinea-pigs of 250 to 300 grams body wt.; no ill effects were thereby produced, as a rule. Twenty-four hours later from 0.1 to 1.0 cc. of milk was injected into each animal, usually intraperitoneally, at times intravenously. The milk produced marked anaphylactic phenomena in the animals which had received blood serum from patients (aged from 8 months to 3 years) who were suffering from inflammatory exudative diathesis. The results indicated that definite anaphylaxis to foreign protein exists in this disease, and that the majority of the phenomena occurring during the disease are truly anaphylactic. When this technic was applied to cases of periodic vomiting of children (age of patients, over 4 years), similar phenomena occurred in several, but not all, the cases; expts. with this disease, and with both marasmus and milk overfeeding (children between 3 and 12 months of age) indicated that the anaphylactic reaction is not as clear cut with these diseases as with inflammatory exudative diathesis.

JOSEPH S. HEPBURN.

**Mantoux reaction in children.** OSCAR REISS. *Arch. Pediatrics* 35, 714-7(1918).—The Mantoux intracutaneous test was applied to 120 children—age from 3 days to 14 years—0.005 mg. of old tuberculin in normal saline being administered, and normal saline being used as a control. For comparison, the von Pirquet test was also applied; the latter test was never positive in the absence of a positive Mantoux reaction, but was negative in 3 cases which gave a positive Mantoux reaction. The intracutaneous test apparently was somewhat more reliable than the von Pirquet test. A positive Mantoux reaction must present a central papule at least 0.2 by 0.4 cm. in dimension with a surrounding areola; the normal saline control reveals the sensitivity of the skin. Repeated tests of 4 cases of tuberculous meningitis uniformly gave negative results; apparently these cases do not respond to cutaneous tuberculin tests.

J. S. H.

**Method of Vernes for sero-diagnosis of syphilis.** ROGER DOURIS AND ROBERT BRICQ. Lab. Syphilography, Ministry of the Interior, Paris. *Bull. soc. chim.* 23, 472-8(1918).—The reagents used are sheep erythrocytes, pig serum, and a colloidal suspension of perethynol. The sheep corpuscles are obtained from defibrinated blood, and are washed with the aid of centrifugation until the supernatant liquid is colorless; the wash soln. is slightly hypertonic, containing 9.5 g. NaCl, 0.15 g. NaHCO<sub>3</sub>, 0.42 g. KCl, 0.125 g. CaCl<sub>2</sub> in 1 l. of soln.; if the corpuscles tend to hemolyze, this phenomenon is prevented by doubling the concn. of the CaCl<sub>2</sub> in the soln. The sediment of erythrocytes is mixed with an equal vol. of the wash soln. Six portions (0.025, 0.050, 0.075, 0.100, 0.125, and 0.150 cc.) of the resulting suspension are dild. with distd. H<sub>2</sub>O, so that the final vol. of each is 2.6 cc. The colors obtained are compared with the color scale of Vernes. By successive approximations is detd. the vol. of suspension required to yield 8 on the color scale. This vol. is dild. to 0.8 cc. before use, and contains the standard amt. of red cells. The pig serum is standardized by use of 12 successive portions, ranging from 0.025 to 0.300 cc., the increment being 0.025 cc.; each portion is dild. to a vol. of 1.6 cc. with 0.9% NaCl soln., mixed with the standard amt. and vol. of erythrocytes, and incubated for 25 min. at 37°. A control expt. without serum is also made (no hemolysis). This titration is repeated with the serum dild. 1:4 with 0.9% NaCl soln., using successive portions of dild. serum from 0.200 to 0.675 cc.; the increment is 0.025 cc.; the details are as before. After incubation, the solns. are centrifuged; and the vol. of serum required for total hemolysis is detd.; it generally is from 0.130 to 0.150 cc. This standard amt. of serum is dild. to a vol. of 0.2 cc. before use by addition of pig serum which has been rendered non-hemolytic by heating for 30 min. at 55°. The perethynol is prepd. from ground, fresh horse heart by dehydration with 95% alc., drying at 37° for 15 to 20 hrs., grinding to a fine powder, extn. with ethylene perchloride, boiling at 115-121°, drying at 37°, and finally extn. with abs. alc. This final abs. alc. soln. is adjusted so that it contains 15 g. of solids per l., and then forms perethynol. This soln. is run in a fine stream into 40-fold its vol. of 0.9% NaCl soln., while agitating the latter. The resulting colloidal suspension is the reagent. Blood is drawn from the patient's vein; the serum is centrifuged, then heated for 20 min. at 55°. In the detn. proper, 0.2 cc. of human serum, 0.8 cc. of perethynol reagent, and the standard amt. and vol. (0.8 cc.) of pig serum are mixed; in the chief control, the perethynol is replaced with 0.9% NaCl soln.; after incubation for 75 min. at 37°, the standard amt. and vol. (0.8 cc.) of erythrocyte suspension is added to each, and incubation is continued for 20 to 30 min. The solns. are then centrifuged, and the degree of hemolysis is detd. by comparison with the color scale. Control expts. are also made on the reagents: (1) perethynol, serum, and erythrocytes, (2) serum and erythrocytes, (3) erythrocytes alone. In all 4 controls, the reading should be 8 on the color scale. In the detn. proper, a normal serum reads 8 on the color scale, while syphilitic sera give either partial or no hemolysis, and have syphilometric indices (color scale readings) from 0 to less than 8. Cerebrospinal fluid may be drawn by lumbar puncture, and tested without preliminary heating, using 1.6 cc. of the fluid; the pig serum is not dild. to its standard vol.; the technic otherwise is as for blood serum. The index should be detd. frequently on the same patient, and plotted on a curve; a single detn. has merely a transient value, showing the intensity of the infection at the time of the detn.; the curve throws light on the nature and course of the infection and its resistance to treatment. Cf. C. A. 13, 459.

JOSEPH S. HEPBURN.

**The influence of menstruation on acidosis in diabetes mellitus.** GEORGE A. HARROP, JR. AND HERMAN O. MOSENTHAL. Johns Hopkins Hosp. *Bull. Johns Hopkins Hosp.* 29, 161-3(1918).—In the case reported menstruation was accompanied by an increase in acidosis. The glucosuria and N elimination were both much in-

creased and permanent damage was done to the carbohydrate metabolism as the symptoms became more marked with each successive period until fatal coma occurred. "This is not a common sequence of events, but may possibly be regarded as an indication that diabetic patients should be closely observed during the menstrual period." A. P. L.

**Presence of complement in the blood stream.** RENÉ BÉNARD. *Compt. rend. soc. biol.* 81, 240-1(1918).—In view of the resemblance between complement and enzymes B. has attempted to ascertain whether complement exists in the blood as such or as a zymogen. Freshly drawn blood was mixed with  $\frac{1}{2}$  its vol. of isotonic oxalate soln. (0.28 g.  $K_2C_2O_4$ , 0.45 g. NaCl, 100 g. distd.  $H_2O$ ) and centrifuged. Complement fixation was studied as in the usual Wassermann reaction, the isotonic oxalate soln. being used instead of physiol. NaCl soln. and the proportion of oxalated plasma being doubled so as to correspond to the amt. of serum ordinarily employed. The results indicate that: (1) the oxalate soln. does not prevent hemolysis with guinea pig complement; (2) no hemolysis occurs with oxalate soln. in the presence of erythrocytes and hemolytic serum and in the absence of oxalated plasma; (3) oxalated plasma contains complement. B. concludes that complement exists preformed in the blood stream and not as a zymogen. H. S. PAINE.

**Persistence of reducing power of the cerebrospinal fluid in cerebromeningeal infections of traumatic origin.** MESTREZAT, WEISSENBACH AND BOUTTIER. *Compt. rend. soc. biol.* 81, 655-7(1918).—In a no. of cases of cerebromeningeal infection with fatal issue following cranial traumatism the reducing power of the cerebrospinal fluid not only persisted but was, in the majority of cases, greater than normal. It is possible that bacterial consumption of sugar was masked by an afflux of reducing substances liberated by decompn. of elements of the blood and nerve tissue. The value of the reducing power of the cerebrospinal fluid cannot in general be regarded as a criterion of the presence or absence of infection. H. S. PAINE.

**Absence in syphilitic serum of immunizing substances with action against icterohemorrhagic virus.** S. COSTA AND J. TROISIER. *Compt. rend. soc. biol.* 81, 165-7(1918).—The serum of syphilis patients (untreated, recent, secondary syphilis—treated syphilis of long standing—treated syphilis of very long standing—doubtful syphilis with positive Bordet-Wassermann reaction) was injected into guinea pigs together with active icterohemorrhagic virus. Icterus followed by death ensued in practically all cases. C. and T. had previously obtained a positive complement fixation reaction in icterohemorrhagic spirochetosis with both syphilitic and spirochetic antigen, while Martin and Pettit had obtained positive results with syphilitic serum in the presence of spirochetic antigen. H. S. PAINE.

**Bacteria present in complications of grippe; attempts at curative antistreptococcic hetero-vaccination.** J. GATE AND M. DECHOSAL. *Compt. rend. soc. biol.* 81, 1245-7(1918).—Treatment with an antistreptococcic vaccine gave distinctly positive results in cases where streptococcic infection was manifest. The Pfeiffer bacillus was only encountered once in sputa and not at all in blood cultures and pleural liquids. Pneumococci were found in a considerable no. of instances. In some cases no characteristic pathogenic agent was found in the sputa. H. S. PAINE.

**Hyperalbuminosis of the cerebrospinal fluid in traumatism of the cranium.** LECÈRE, MESTREZAT AND BOUTTIER. *Compt. rend. soc. biol.* 81, 597-600(1918).—Study of a considerable no. of various types of serious traumatisms of the cranium (in wounded soldiers) showed that hyperalbuminosis of the cerebrospinal fluid was the most characteristic reactional criterion of the gravity of the lesions produced; more or less pronounced hyperalbuminosis was usually observed without decrease in chloride or sugar content and without any marked accompanying cytological reaction.

Favorable evolution of the traumatism was associated with albumin contents little, if any, greater than 0.50 g. per l. Values of 1.0 g. or more per l. were almost always observed in cases with fatal issue; this was true regardless of whether the occurrence of hyperalbuminosis was sudden or gradual. In certain cases with fatal issue in which aseptis had not been maintained albumin contents of 4.50-4.60 g. per l. were attained. Hyperalbuminosis in the case of serious traumatism of the cranium (contusion, fracture or even wounds of the brain) appears to be due less to localized lesions (produced directly by the projectile, etc.) than to an extended reactional process associated with production of lesions due to shock.

H. S. PAINE.

**Cases of acute alveolar pyorrhea treated with neosalvarsan.** B. KRICHEVSKII. *Compt. rend. soc. biol.* 81, 620-1(1918).—*Sp. buccalis* predominated in the flora of the secretions. Intravenous injections of 10-30 cg. neosalvarsan in the severe cases and local instillations of a 1:100 glycerol soln. of neosalvarsan in the mild cases caused practically complete disappearance of the spirochetes and amelioration of the symptoms in the patients (soldiers).

H. S. PAINE.

**Serodiagnosis of syphilis; precipitation methods and nature of the Wassermann reaction.** M. RUBINSTEIN AND A. RADOSAVLJEVICH. *Compt. rend. soc. biol.* 81, 1145-7(1918).—Pptn. phenomena were studied by mixing human serum in the usual amt. (0.2 cc.) with syphilitic antigen (0.3 cc.) in a total vol. of 2 cc. (addition of distd. H<sub>2</sub>O), keeping the mixt. 1 hr. at 37° (Wassermann) or 0° (Jacobsthal) and centrifuging. Fresh, unheated, normal or syphilitic sera (without addition of antigen) were pptd. by distd. H<sub>2</sub>O under these conditions; a ppt. was rarely obtained with heated sera. An abundant ppt. was always produced in the presence of antigen in the case of both normal and syphilitic sera, these sera having been previously inactivated (30 mins. at 56°) or used without being heated. It was impossible to differentiate syphilitic from non-syphilitic sera either by the amt. of ppt. produced or by treatment of the ppt. with physiol. NaCl soln. The ppt. obtained by action of serum and antigen was dissolved by physiol. NaCl soln. with production of slight turbidity. This dissolved ppt. fixed complement in a sp. manner in the case of heated sera and in a const., non-sp. manner in the case of unheated sera. The globulin ppt. from unheated sera (0.2 cc. serum + 1.8 cc. distd. H<sub>2</sub>O), when dissolved in physiol. NaCl soln., often (but not constantly) fixed complement; addition of antigen always rendered the reaction positive, even with the globulins of non-syphilitic sera. It is therefore possible in the above manner to isolate a complex (heated serum + antigen) which fixes complement specifically. The supernatant liquid from the ppt. obtained by centrifuging was clear and limpid, while the antigen alone, when dild. and centrifuged, retained its original degree of turbidity; the complex which inactivates complement appears to be composed of a heavier "mol." produced by union of serum and antigen. The liquid, when freed from this sp. complex and rendered isotonic, showed no regularity in its ability to fix complement. Most of the reactions were studied in parallel at 37° and 0° owing to the fact that globulins are more readily pptd. at lower than at higher temps. When 0.2 cc. of serum was mixed with increasing (3-10) vols. of distd. H<sub>2</sub>O pptn. was considerably more pronounced at 0° than at 37°; the physical appearance of the ppt. was also different at the 2 temps. This increased pptn. of globulins at 0° probably explains why a positive Jacobsthal reaction may be obtained in cases (especially syphilis of long standing) in which the Wassermann reaction is negative. It is also probable that the globulins of the sera of syphilis of long standing are both qual. and quant. different from those of sera of recent syphilis, thus in some instances causing a ppt. at a lower and not at a higher temp. (a difference is also observed between heated and unheated sera).

H. S. PAINE.

**Analysis of a rhinolith.** KARABEDIAN AND CIARLAN. *Ann. chim. anal. chim.*

appl. 1, 12-3(1919).—The authors report the following analysis: wt., 0.477 g.; loss at 100°, 14.05; loss on ignition, 16.34; sol. in boiling H<sub>2</sub>O (Cl-free), 1.17; Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>, 48.14; CaCO<sub>3</sub>, 12.58; undetd., 7.72%.

F. W. SMYTH.

EWING, JAMES: *Neoplastic Diseases: A Textbook on Tumors*. Philadelphia: W. B. Saunders Co. 1027 pp. \$10. For review see *J. Am. Med. Assoc.* 72, 750.

KOLMER, JOHN A.: *A Practical Textbook of Infection, Immunity and Specific Therapy*. 2nd Ed. Philadelphia: W. B. Saunders Co. 978 pp. \$7.50. For review see *Am. J. Public Health* 8, 795(1918). Cf. *C. A.* 9, 919.

VEDDER, EDWARD B.: *Syphilis and Public Health*. Philadelphia: Lea & Febiger. 315 pp. \$2.25. For review see *Am. J. Public Health* 8, 794(1918).

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

**Milk secretion and carbohydrates injected subcutaneously.** UBALDO SAMMARTINO. Univ. Rome. *Arch. farm. sper.* 25, 146-60, 213-24, 257-77, 353-73(1918).—Injection of sucrose in large doses inhibits, while in smaller doses it stimulates milk secretion. The sucrose treatment was found useful in cases of both hyper- and hypogalactia.

A. W. DOX.

**Gastritis from asphyxiating gases.** UBALDO SAMMARTINO. Univ. Rome. *Arch. farm. sper.* 25, 300-20(1918).—Guinea pigs killed by exposure to phosgene and bromine developed lesions of the esophagus and stomach as follows: phosgene—hyperemia, hypersecretion, edema, severe swelling, cellular necrosis; bromine—ischemia, hypersecretion, dehydration, cellular necrosis, complete destruction.

A. W. DOX.

**Myrtol poisoning; with comments upon the toxicity of eucalyptus oil and myrtol in human beings and in animals.** LEWELLYS F. BARKER AND LEONARD G. ROWNTREE. Johns Hopkins Hosp. and Univ. *Bull. Johns Hopkins Hosp.* 29, 215-21(1918).—"Derivatives of plants belonging to the natural order *Myrtaceae*, and especially oil of eucalyptus and myrtol, may in large doses cause profound intoxication. In certain persons there is an idiosyncrasy, the symptoms of intoxication occurring after minute or therapeutic doses. The intoxication may affect chiefly the nervous system or chiefly the skin; in some persons, nervous and cutaneous manifestations are simultaneously observable. Recovery occurs in most instances, though several fatalities following eucalyptus poisoning have been reported. The symptoms of intoxication of the nervous system observed in man can be reproduced in animals by subcutaneous and by intraperitoneal administration of myrtol."

A. P. LOTHROP.

**Dakin's solution and Dakin's oil in the normal peritoneal cavity of the dog.** ERNEST G. GREY. Johns Hopkins Hosp. *Bull. Johns Hopkins Hosp.* 29, 221-3(1918).—"Both the neutral soln. of chlorinated soda (Dakin's soln.) and dichloramine-T in chlorinated paraffin (Dakin's oil), when injected into the normal peritoneal cavity of a dog, lead to an inflammatory reaction, the degree of which is directly proportional to the amt. of Cl antiseptic used. With a sufficient quantity (less of the oil suffices) death ensues. When either of the Cl antiseptics is injected into the gall-bladder of a dog no abnormal symptoms appear. Following the injection of the oil, however, the gall-bladder becomes thickened and shrunken, though the remainder of the biliary tract shows no discernible changes. A small amt. of Dakin's oil, when injected into the normal pleural cavity of an unanesthetized dog, may lead to a rapid (reflex?) death. Since Dakin's oil particularly has been used without recognizable ill effects in certain infections of the abdominal cavity, the results from the expts. outlined suggest that the wall of an abscess cavity or sinus must play an important part in protecting the peritoneum in general from the effects of the free Cl. They also suggest that the maintenance of an adequate drainage tract is an indispensable part of the technic for using

antiseptics of this nature within the abdomen. Until more evidence is at hand, then, both of the Cl antiseptics should be used in intra-abdominal infections with caution and certainly only in carefully selected cases."

A. P. LOTHROP.

**Behavior of Sudan III in the animal organism.** B. E. READ. Yale Univ. *J. Biol. Chem.* 37, 121-35(1919).—"The original purpose of the present expts. was to reinvestigate the seemingly contradictory statements with regard to the path of elimination of the fat-sol. dye Sudan III, and particularly the contention of Salant and Bengis (*C. A.* 10, 2935) regarding the excretion of Sudan III by the kidneys. The products of various manufacturers were used and gave varying results, which led to interesting observations on the doubtful purity of preps. of Sudan III obtainable on the market at present. Expts. made with the purified product, on the other hand, gave definite results, thus showing the need of careful examn. of all preps. of Sudan III used in scientific work to guarantee its purity before drawing conclusions supposedly based upon its properties as a pure, neutral, fat-sol. dye." The dye may be purified by dissolving it in alc. or glacial AcOH and pptg. it in H<sub>2</sub>O to remove all H<sub>2</sub>O-sol. substances. This process should be repeated and gives a fine brick-red powder of low m. p. (120-130°) similar to that of the com. article. It should then be recrystd. 3 or more times out of hot glacial AcOH and the purity of the fine, sheeny, flocculent, green-brown crystals, judged by the m. p., 195°. Very impure products must be dissolved in a lipid solvent and shaken out with dil. aq. alk. and acid alternately until the aq. solvent ceases to take up any further color. When dissolved in oil and administered intraperitoneally, subcutaneously or by mouth, Sudan III is absorbed and may be traced in the lymph, blood and bile. It is transported to the fatty tissue and is deposited especially in the omentum. When the pure dye is fed even in large amts., none is excreted in the urine of normal animals. It is found in the feces, soft deep red stools being obtained in from 2 to 4 hrs. Com. preps. contain more or less impurity of a toxic nature and may cause great debility, stunt the growth, produce a neuritic-like condition and be fatal in large doses. The foreign substances may be excreted by the kidney and appear in the urine as deep colored pigments.

A. P. LOTHROP.

**Action of adrenaline on the heart as studied by radioscopy.** M. LORPER, H. DUBOIS AND C. WAGNER. *Compt. rend. soc. biol.* 81, 85-6(1918).—A large no. of normal and pathol. subjects was examd. by this method before and after injection of 1 mg. epinephrine. Cardiac dilatation occurred in most of the pathol. cases; little or no change (occasionally a slight reduction in vol.) was noted with normal subjects. Cardiac dilatation produced by epinephrine appears to be a passive phenomenon caused by the counter pressure resulting from the sudden peripheral vasoconstriction. Practical constancy of heart vol. after injection of epinephrine indicates normal cardiac resistance to vascular counter pressure, while dilatation is indicative of cardiac insufficiency of some kind.

H. S. PAINE.

**Toxicity of colloidal arsenic and arsenic compounds.** L. LAUNOY. *Compt. rend. soc. biol.* 81, 164-5(1918).—The comparative toxicity of the As compds. commonly employed in therapy is as follows (order of decreasing toxicity): alk. arsenites, alk. arseniates, colloidal As, arrhenal, acetyl-atoxyl, atoxyl, Na cacodylate. Intraperitoneal injection of 0.01-0.016 g. colloidal As per kg. in guinea pigs was sufficient to cause death in 3-6 days; intraperitoneal injection of 0.0083 g. As caused death in about 10 days. The coeff. of toxicity of colloidal As was 0.0083-0.016 g. per kg. The colloidal As employed was prepd. by the Auger method; 2 samples contained 0.001245 g. and 0.0028 g., resp., of As per cc. No stabilizer was used; the solns. were transparent and of brownish color and the As was rapidly oxidized on contact with air. As in the case of other As derivs., death ensued slowly after injection of limiting toxic doses and the usual symptoms of hepatic and renal degeneration characteristic of As

intoxication were observed during this period of "incubation;" a max. loss of wt. equal to  $\frac{1}{4}$  of the original wt. was observed during this period. It was impossible to make 3 successive injections in guinea pigs (even at 8-day intervals) of 0.005 g. As per kg. each without causing death. These results are distinctly different from those reported by Sorev (*C. A.* 13, 241).

H. S. PAINE.

**Slight toxicity of colloidal arsenic obtained by mechanical means; reply to Launoy.** E. SOREV. *Compt. rend. soc. biol.* 81, 563-4(1918).—S. replies to the criticism of Launoy (cf. preceding abst.). The colloidal As employed by S. was obtained by mechanical means (24 hrs. trituration of As) instead of being produced chemically as in the case of that used by L. The particles were fully as small as those of chemically or electrically produced colloidal As and showed Brownian movements similar to those of other types of colloidal As; the particles were maintained in suspension in a gummy excipient. The above difference in method of prepn. may possibly explain in part the variation in results obtained. The difference in results is also due in part to the fact that L. employed guinea pigs while S. used rabbits as exptl. animals. The lethal dose for guinea pigs of the colloidal As used by S. was 0.03 g. per kg., while the lethal dose of L.'s colloidal As was only 0.016 g. per kg. Guinea pigs are in addition more sensitive than rabbits to colloidal As; intravenous injection in rabbits of 0.05 g. of mechanically produced colloidal As per kg. was often innocuous.

H. S. PAINE.

**Action of sodium citrate on the blood.** FOLLEY. *Compt. rend.* 167, 653-4(1918).—This study was made to det. the utility of citrated blood for use in transfusion, especially in war wounds. The expts. were made with human or rabbit blood in which 10 cc. of a 10% soln. of  $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$  were added to 200 cc. of blood. Citrated blood allowed to stand several hrs. at 18 to 23° was not coagulated by the addition of a small amt. of recent clot, or of the juices of various unwashed tissues, but was coagulated by the addition of  $\text{CaCl}_2$ . Blood of man or animal which had received an injection of gelatin, horse serum, antitetanic serum, or even its own serum, coagulated much more rapidly when removed from the vessels. This blood mixed with  $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7$ , after having been properly drawn by puncture of a vein, did not coagulate more rapidly than normal blood.

L. W. RIGGS.

**Dinitrobenzene poisoning.** O. STEINER. *Correspondenz-Blatt für Schweizer Aerzte* 48, 1139(1918); *J. Am. Med. Assoc.* 71, 1445.—Seven cases are described. The mucus membranes and sometimes the entire skin are colored gray. The blood appears gray and thick, but the differential count is normal except that there is an excessive destruction of red cells. Treatment consists in O inhalations, free withdrawal of blood followed by infusion of  $\text{NaHCO}_3$  with stimulants and copious drinking of milk. Clothing should be removed from the room and the patient receive a thorough bath, especially of the hands and hair, with hot water and soap.

L. W. RIGGS.

**Atropine and induced antianaphylaxis as a protection against acute arsphenamine reactions.** J. H. STOKES. Rochester, Minn. *J. Am. Med. Assoc.* 72, 241-3(1919).—A case is reported and the following conclusions are stated: The acute "nitritoid" crisis or reaction to arsphenamine is a form of anaphylactic shock, explainable on physicochem. grounds as a result of a pptn. either of the drug from its colloidal soln., or of the colloids of the blood plasma, by the drug, or by an impurity. The reaction following the injection of an acid or only partially alkalinized soln. of arsphenamine either too rapidly or in too high concn. is presumably of the same type. The nitritoid crisis can apparently be inhibited by a previous injection of atropine ( $\frac{1}{50}$  grain), which further suggests that the reaction is a form of anaphylactic shock. The induction of antianaphylaxis as described above further supports the belief that the nitritoid crisis is a form of anaphylactic shock. The induction of antianaphylaxis in

patients exhibiting persistent idiosyncrasy to arsphenamine or neo-arsphenamine has proved clinically useful, and, as a means of increasing their tolerance of the drug, deserves further trial and study.

L. W. RIGGS.

**Research on frog heart.** C. BASTERT. *Nederlandsch Tijdschrift voor Geneeskunde* 2, 1540(1918); *J. Am. Med. Assoc.* 72, 318.—B. reports that when the heart action had been arrested by toxic action from digalen or veratrine, the heart could be started to beating again by the action of HCN. The reverse also occurs, digalen or veratrine temporarily resuscitating the heart arrested by HCN. It was also observed that the heart poisoned with digalen to complete arrest, started to beat again when the pressure was raised, while with HCN arrest it started to beat again only when the pressure was lowered. HCN arrests the heart in diastole, and overcomes the arrest when it occurs in systole. It thus acts like K in Ringer's fluid.

L. W. RIGGS.

**Influence of quinine on stomach functioning.** P. BAUFLE. *Presse Medical* 8, 418(1918); *J. Am. Med. Assoc.* 72, 380.—Test meals were given the same subjects with and without 1 g. of quinine sulfate or hydrochloride in a cachet. The stomach contents were examd. in 30 min. and again 60 min. later, the stomach being rinsed out each time with 200 cc. of water. When there is a tendency to hypersecretion the sulfate should be given the preference. With hyposecretion the hydrochloride should be selected as it stimulates sluggish glands to better secretion. It should be administered from 30 to 40 min. before the meal in 100 to 150 cc. of water. In this way the quinine will have passed out of the stomach before the meal begins, leaving the secretory glands stimulated to a high degree. The sulfate modifies conditions but little, no more than the physiol. range.

L. W. RIGGS.

**Methemoglobinemia due to poisoning by a shoe dye.** RICHARD E. STIFEL. U. S. Army. *J. Am. Med. Assoc.* 72, 395-6(1919).—Eight cases of cyanosis with headache, nausea and general malaise were connected with the wearing of newly dyed shoes, and this cause was confirmed by direct expts. with the dye in question. Chem. examn. showed that the dye contained nitrobenzene, which accounted for the symptoms. If shoes are not worn until several days after dyeing the ill effects may be avoided.

L. W. RIGGS.

## I. ZOÖLOGY.

R. A. GORTNER.

**Studies on the nutrition of fish. Experiments on brook trout.** SERGIUS MOR-  
GULIS. Creighton Univ. College of Med. *J. Biol. Chem.* 37, 391-413(1919).—Trout will remain in good condition and gain in wt. when kept in museum jars containing as little as 4-5 l. of H<sub>2</sub>O provided the H<sub>2</sub>O is properly aerated and changed every 48 hrs. Whenever possible the trout were taught to take their food directly from forceps so that the washing out of sol. constituents of the food by the H<sub>2</sub>O was entirely prevented in most cases. They were fed *ad libitum* so that there were at no time any food particles to contaminate the H<sub>2</sub>O in the aquaria and affect the significance of the results. The solid excreta were removed by filtering the contents of the jars through glass wool in modified Gooch crucibles consisting of large Al tumblers, the bottoms of which were perforated with fine holes. The glass wool was chosen because it was necessary to increase the bulk of the feces without interfering with the analysis and because it was especially serviceable in helping to reduce the dried feces to an extremely fine state of subdivision and uniform distribution when ground with them. N and fat detns. were made on the feces. The N in the dissolved excreta (urine) was detd. after concn. of the H<sub>2</sub>O from the jars by a suitable and rapid procedure. On a diet of raw beef heart the % utilization of the food under normal conditions was high, 96.1% of the protein and 94.5% of the fat being utilized. Fasting has a deleterious effect on the digestive functions of the trout and especially affects the absorption of fat, the utiliza-



tion dropping to 91.7%. "Fasting trout eliminate 80-90 mg. of N per day per kg. But if the fast has been preceded by a liberal diet, the N elimination for the first few days may greatly exceed this. About  $\frac{1}{4}$  of the loss in body wt. is at the expense of protein. A comparison of diets consisting of raw and cooked beef heart showed that both are equally well utilized in the organism of the trout, but a greater gain in body wt. is secured from the former. Increase in wt. does not bear a direct relation to the absolute quantity of food consumed. This study failed to justify the use of beef liver as a dietary article for trout."

A. P. LOTHROP.

**Fumigation with chloropicrin.** WILLIAM MOORE. *J. Econ. Entomology* 11, 357-62(1918).—Chloropicrin is mol. for mol. about 283 times as toxic to insects as  $\text{CS}_2$ . Unlike  $\text{CS}_2$ , it is not explosive unless heated; its vapors are about twice as heavy as those of  $\text{CS}_2$ ; hence they will readily disseminate downward through a mass of grain or clothing. Expts. proved that  $\frac{1}{2}$  lb. chloropicrin per 1000 cu. ft. would kill the bean weevil (*Bruchus obtectus*), the Anguimoid grain moth (*Sitotroga cerealella*), the Indian meal moth (*Plodia interpunctella*), and the Mediterranean flour moth (*Ephesia kuehniella*), but would not kill the confused flour beetle (*Tribolium confusum*) when more than 1 inch below the surface of the flour. One-2 lbs. per 1000 cu. ft. are necessary for the latter insect. If the quantity of flour fills the entire space of the container, larger doses are necessary.  $\text{CS}_2$  gives satisfactory results only above  $18.3^\circ$ , while chloropicrin is effective below  $15.6^\circ$ . The germination of grain is not injured by doses of  $\frac{1}{2}$  lb. per 1000 cu. ft.; larger doses are injurious if germination is attempted before the grain has had a thorough airing. It is also necessary that the grain be dry. Chloropicrin free from  $\text{Cl}_2$  will not bleach flour, but it has a slight effect on the baking quality of the bread through its inhibitory action on the yeast. Bread made from this flour was not toxic to lab. animals. Chemically pure chloropicrin used at the rate of 2 lbs. per 1000 cu. ft. did not affect the colors or the fabric of clothing. While not at present obtainable on the market, chloropicrin can be manufactured more cheaply than  $\text{CS}_2$ . It can not be used on a large scale unless means are provided for the rapid removal of the vapors which are extremely irritating to the eyes and nasal membranes. It is suggested as a fumigant for small quantities of seeds, for the destruction of ants nests, gophers, and in light doses for the eradication of mosquitoes in yellow fever regions.

CHAS. H. RICHARDSON.

**Observations on the mode of action of contact insecticides.** WILLIAM MOORE. *J. Econ. Entomology* 11, 443-6(1918).—When methylene blue is injected into the body of an insect in the absence of O, it is reduced to the leuco compd. and the insect's body assumes a white or yellowish white color. When an injected insect is dipped in light lubricating oil, olive oil, toluene,  $\text{CCl}_4$ , xylene, nitrobenzene, nicotine,  $\text{Et}_2\text{O}$ , soap soln. or water, the tracheae are penetrated and blocked so that the white color persists till they are removed when the blue color returns. These expts. show that a contact insecticide containing oil or soap soln. may penetrate the tracheae of an insect, preventing normal oxidation and thus killing the insect. Small insects, like the plant lice (Aphididae) are easily killed, but larger species such as the tarnished plant bug (*Lygus pratensis*) are not so easily covered, and it is necessary to add a compound to the spray which will kill through its chem. action. Some insects like the clothes louse (*Pediculus corporis*) have the ability to close the tracheae so quickly that soap solns., lubricating oils, xylene and ether can enter only with difficulty. The hog louse (*Haematopinus suis*) and the dog louse (*H. piliferus*) also possess this power, but in a lesser degree than the clothes louse. A number of other species of insects examd. did not possess this power of resisting the entrance of solns. into the respiratory system. This subject has an important bearing on the type of dips most effective against certain insects.

CHAS. H. RICHARDSON.

**Light reactions and metabolism in may-fly nymphs.** W. C. ALLER AND E. R. STEIN, JR. *J. Expt. Zoology* 26, 423-58(1918).—The nymph of *Epeorus* responds positively to light under normal conditions. A reversal in the reaction to light was induced by treatment with EtOH, CaCl<sub>2</sub>, lowered temp., and other reagents. Nymphs which showed a reversal had a lower rate of metabolism, as measured by resistance to KCN solns., than normal, untreated nymphs. Nymphs of *Leptophlebia* normally show a negative reaction to light. Their reaction was reversed by treatment with EtOH, HCl, H<sub>2</sub>SO<sub>4</sub>, KOH, NaOH, KCN, KCl, NaCl, and CaCl<sub>2</sub> with accompanying stimulation or depression as indicated by the resistance to KCN solns. A negatively responding nymph belonging to the Heptageninae was treated with HCl, KCN, EtOH, and strychnine. With HCl and KCN reversal was the rule, but with EtOH and strychnine no reversal occurred. Individuals which were reversed showed an increased CO<sub>2</sub> production as measured by Tashiro's biometer. "These expts. conclusively demonstrate that the phototactic reaction of these nymphs is correlated with the metabolic condition and indicate, but do not prove, that certain changes in metabolism cause reversal in reaction to light. All nymphs that reversed their light reactions were either stimulated or depressed, but stimulation or depression did not necessarily involve phototactic reversal."

CHAS. H. RICHARDSON.

**Studies on the physiological significance of certain precipitates from the egg of *Arbacia* and *Asterias*.** ALVALYN E. WOODWARD. *J. Expt. Zoology* 26, 459-500 (1918).—The eggs of these animals secrete a substance into the sea water which activates, aggregates, reversibly agglutinates and paralyzes the sperm of the same species. Its presence is necessary for the fertilization of the egg. Its value as a parthenogenetic agent is destroyed by boiling, which, however, does not destroy its agglutinating properties. It is apparently colloidal, contains C and N, but gives no positive tests for protein. A faint yellow color was obtained with the xanthoproteic test. With (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, a sperm agglutinin is pptd. BaCl<sub>2</sub> and acetone pptd. a parthenogenetic agent. An enzyme called provisionally lipolypsin was found in the secretion. Serum from *Asterias* and *Arbacia* inhibited autoparthenogenesis and sperm fertilization. Similar results were obtained with "Purple X" and "Salmon X," substances extracted from the testicular or ovarian tissues of *Arbacia* and *Asterias* by boiling. An anti-fertilizin obtained from eggs which have been freed from the activating secretion, and an unsaturated fatty acid which can be extracted from the eggs with ether also inhibited autoparthenogenesis and sperm fertilization. Parthenogenetic agents are placed by the author in three groups: (1) The fat solvents, including lipolypsin, Et<sub>2</sub>O, CHCl<sub>3</sub>, BuOH, etc.; (2) the halogen compds., iodine and various salts; (3) physical methods which may change the physical or quantitative relations of substances within the egg. These agents produce development in uninseminated eggs, as well as eggs which have been made resistant to fertilization. It is probable that enzymes in the resting egg tend to produce development. Their action may be inhibited by unsaturated fatty acids. The egg remains in the resting stage so long as the activity of these enzymes is inhibited by the fatty acid, but when mature and in a suitable medium, the egg produces a lipolypsin which binds the acid and development proceeds.

CHAS. H. RICHARDSON.

**Reversion in the sense of orientation to light in the colonial forms, *Volvox globator* and *Pandorina morum*.** S. O. MAST. *J. Expt. Zoology* 27, 367-90(1917).—These organisms give practically the same reactions to light; they may be either positive or negative. Colonies which have become adapted to the dark usually react positively in weak and negatively in strong illumination. Colonies adapted to light are sometimes positive in strong and negative in weak illumination. Continuous illumination causes dark-adapted colonies to become at first neutral, then positive, passing through

a maximum, then neutral again, then negative, passing through a maximum, neutral a third time and finally positive. Reversion is dependent upon the time of exposure as well as the intensity of illumination. More energy in meter-candles hrs. is required to induce reversion in high than in low illumination. Reversion is not primarily dependent upon photosynthesis because red and yellow light, in which photosynthesis is relatively strong, have little effect on reversion. Green and blue light, while relatively weak in photosynthetic power, have the greatest stimulating efficiency and are most potent in producing reversion. Increase in temp. causes negative specimens to become positive; decrease in temp. causes the reverse, but the response to temp. is subject to considerable variation. Alkalies, EtOH and Et<sub>2</sub>O have practically no effect on reversion. Acids and CHCl<sub>3</sub> cause negative colonies to become strongly positive, but reversion is not specifically dependent on the concn. of the chemicals. The effect of acids is probably due to the accompanying reduction in alkalinity of the culture soln. The sense of orientation to light is dependent upon the physiological state of the colonies and the constitution of the culture medium. Young colonies are more likely to be negative than old. Reversion is probably associated with changes in permeability, positive orientation being associated with an increase and negative orientation with a decrease in permeability.

CHAS. H. RICHARDSON.

Effects of chemicals on reversion in orientation to light in the colonial form, *Spondylomorom quaternarium*. S. O. MAST. *J. Expt. Zoölogy* 26, 303-30(1918).—This colonial animal responds positively or negatively to light, depending upon the conditions. CHCl<sub>3</sub>, Et<sub>2</sub>O, chloral hydrate, H<sub>2</sub>CO<sub>3</sub>, HCl, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, MeOH, H<sub>2</sub>BO<sub>3</sub>, H<sub>2</sub>CrO<sub>4</sub>, tannic acid, tartaric acid and oxalic acid made negative specimens become strongly positive, but were without effect on positive specimens except perhaps to make them more strongly positive. EtOH, NH<sub>4</sub>Cl and pure H<sub>2</sub>O are without appreciable effect on positive colonies, but probably cause negative colonies to become slightly positive. HCHO, sucrose, O<sub>2</sub>, H<sub>2</sub>O<sub>2</sub>, MgSO<sub>4</sub>, CaCl<sub>2</sub>, KNO<sub>3</sub>, NaOH, KOH and NH<sub>4</sub>OH are without effect on the sense of orientation. Increase in concn. of the culture solution causes positive colonies to become strongly negative; decrease in concn. causes negative colonies to become strongly positive. Increase in temp. and decrease in illumination cause negative colonies to become positive; decrease in temp. and increase in illumination cause positive colonies to become neg. But the sense of orientation is not specifically related to the concn. of chemicals in the environment. This species may probably be either positive or negative in any soln. in which it will orient at all. Acids probably affect the sense of orientation by reducing the concn. of OH<sup>-</sup> in the culture solns. It is thus apparent that the same change in orientation may be effected by a number of different factors. Change in orientation is probably due to some specific change in the physiol. process in the organism. Change in orientation depends upon the time rate in the change of concn. or intensity of the effective factors, but it has not been shown that this depends upon the time rate of change in the physiol. processes involved in the reaction.

CHAS. H. RICHARDSON.

Relative effectiveness of food, oxygen and other substances in causing or preventing male-production in *Hydatina*. A. FRANKLIN SHULL. *J. Expt. Zoölogy* 26, 521-44(1918).—Expts. made with *Hydatina* in H<sub>2</sub>O satd. with air mixtures containing 40% and 60% O<sub>2</sub> showed that O<sub>2</sub> is a male-producing agent. The lower concn. was probably a little more effective than the higher. Cultures in which *Euglena* was used as food contained about 62% more O<sub>2</sub> than cultures containing manure scum. The *Euglena*-containing cultures showed an increase in male-production over controls, partly due to the O<sub>2</sub> liberated by *Euglena* and partly, presumably, to the food value of *Euglena* itself. *Euglena* with crude creatine soln. was more effective in male-production than manure scum and oxygenated creatine soln., manure scum and untreated

creatine soln. or manure scum and untreated spring H<sub>2</sub>O. Manure soln. had a repressing effect upon male production which was a little more than offset by the presence of *Euglena* in the cultures. (Cf. C. A. 12, 2099.) CHAS. H. RICHARDSON.

**Demonstration of epithelial movement by the use of vital staining, with observations on phagocytosis in the corneal epithelium.** SHINICHI MATSUMOTO. *J. Expt. Zoology* 27, 37-46(1918).—The epithelium of the cornea of the frog when vitally stained with neutral red and Nile blue exhibited characteristic granules in the cytoplasm. With proper staining, these granules existed throughout the entire period of cell activity, without affecting the cell. The corneal epithelium showed phagocytic activities, taking up both melanin and carmin granules, the position of these granules within the cell being demonstrated by vital staining. The melanin and carmin granules resembled in distribution and arrangement those of neutral red and Nile blue.

CHAS. H. RICHARDSON.

**Anabiosis of the earthworm.** PETER SCHMIDT. *J. Expt. Zoology* 27, 57-72(1918).—Desiccated earthworms lose their mobility completely, diminish in length and vol. to  $\frac{1}{4}$ , or  $\frac{1}{5}$  of the original and appear dead. They can be revived from this state after 39 hrs. at normal summer temp. and after 48 hrs. and perhaps longer at low temp. "Earthworms can revive and regain the normal state of life after a loss of 61.6% of the wt. of the body, or nearly 73% of the wt. of the water contained in the body." The similar results of desiccation in Tardigrada, Rotatoria and Nematodes are considered.

CHAS. H. RICHARDSON.

**The reaction of selachii to injections of various non-toxic solutions and suspensions (including vital dyes), and to excretory poisons.** E. R. HOSKINS AND M. M. HOSKINS. *J. Expt. Zool.* 27, 101-55(1918).—The dog fish, *Musculus canis*, was used in these expts. The digitiform gland excreted 1 cc. per day of a clear, alkaline fluid containing urea. Injected solns., but not suspensions, were recovered from this fluid. Injected excretory poisons, K<sub>2</sub>CrO<sub>4</sub>, tartaric acid and uranium nitrate injured the digitiform gland. Injected solns. were excreted from the kidney of the dogfish as rapidly as from the mammalian kidney. Injected particulate matter was not excreted and insol. vital dyes did not stain the kidney tubules. The excretory toxins were withstood for long periods, eventually producing nephritis. The liver excreted both injected solns. and suspensions, the quantity excreted in a given time being several times greater than that excreted by the kidneys. The liver was stained by insol. dye particles. It was the only organ found which excreted suspended particles. The excretory toxins caused very little injury to the liver which probably excreted them. Injected insol. dyes stained the spleen deeply, the injected particles producing leucocytosis. The excretory toxins caused congestion of the spleen and injured its endothelium. The spiral valve, previously supposed to have an excretory function, would not excrete all the sol. substances injected and insol. dyes were not taken up by its epithelium. The excretory poisons passed through the epithelium of the spiral valve and destroyed it. The stomach did not appear to possess an excretory function. The gill endothelium stored injected trypan blue and coarsely powdered carmine in greater quantity than any cells of the body. The excretory toxins produced proliferation and abnormal amitosis of the endothelial cells of the gills. No evidence that the gills have an excretory function was deduced. The muscles, skin and peritoneum were negative in reaction to non-toxic solns., vital dyes and the toxins used. Sucrose was inverted by the blood of the dogfish, but other non-toxic solns. were reacted to negatively by the blood vascular system. Trypan blue and carmine were occasionally found in the leucocytes and endothelial cells of many organs and tissues. They were of much more frequent occurrence in the endothelium of the bronchial and splenic sinuses and the hepatic sinusoids. The lymphatics were not noticeably stained with vital dyes. The excretory

poisons slightly injured the fixed endothelial phagocytes, especially of the spleen and gills, and caused congestion in all the organs with varying severity. Intramuscular injection of the excretory toxins caused a slow degeneration of the erythrocytes, intravenous injection a sudden destruction of them.

CHAS. H. RICHARDSON.

The effect of adrenine on the pigment migration in the melanophores of the skin and in the pigment cells of the retina of the frog. ANDREW JOHNSON. BIGNEY. *J. Expt. Zoölogy* 27, 391-6(1919).—The frogs *Rana pipiens* and *R. clamitans* were used in these expts. The reactions towards adrenine were the same in both species. Normally, the pigment in the melanophores expands in the light and contracts in the dark. A soln. of adrenine of the proper concn., when injected into the dorsal lymph sac of the frog, causes a contraction of this pigment if it has been previously expanded by light, but if the pigment is already contracted, the adrenine does not alter its position. Concns. of 1:50,000 caused a slight contraction of pigment in expanded melanophores while concns. of 1:500,000 were not effective. Melanophores contracted with adrenine remained in this condition for about 2 hrs.; in 4-5 hrs. they became fully expanded again. The migration of retinal pigment is outward from the cell under the influence of light and into the cell in darkness. Adrenine caused the pigment to expand in the retracted retinal cells, a movement just the reverse from that noted in the melanophores. The effect could be observed with concns. of adrenine of 1:5,000,000. The duration of the expansion of retinal pigment caused by adrenine was about 4 hrs. The optic nerves are not concerned in this action. It is probable that the effect is produced by the adrenine carried by the blood.

CHAS. H. RICHARDSON.

Studies on the relation of iodine to the thyroid. I. The effect of feeding iodine to normal and thyroidectomized tadpoles. W. W. SWINGLE. *J. Expt. Zoölogy* 27, 397-415(1919).—Iodine,  $\text{CHI}_3$  and  $\text{KI}$ , when fed with wheat flour, rapidly stimulated metamorphosis in larvae of *Rana pipiens* and *Bufo lentiginosus*. Iodine also brought about metamorphosis in thyroidless larvae of *Bufo lentiginosus* in an abnormally short time. Normal and thyroidless larvae were quickly killed by very weak solns. of  $\text{I}_2$ ; the addition of flour appeared to restrain this toxic action. The expts. indicate that iodine functions within the organism as a hormone without the intermediation of the thyroid gland, and that the function of this gland is chiefly one of iodine storage. It is suggested that the function of the thyroid under pathological conditions may be entirely different. II. Comparison of the thyroid glands of iodine-fed and normal frog larvae. *Ibid* 417-25.—Thyroid glands of iodine-fed frog larvae are larger than those of controls held at the same body length by underfeeding and the gland follicles of the iodine-fed larvae contain a much greater colloidal mass. Solns. of  $\text{I}_2$  will bring about metamorphosis in frog larvae in a short time. The same effect can also be obtained with  $\text{CHI}_3$  and  $\text{KI}$ , but neither is as active as  $\text{I}_2$ .  $\text{KIO}_3$  apparently has no effect, although eaten readily. It is suggested that amphibian metamorphosis results from the interaction of environmental agencies, such as iodine and its compds., but that the growth processes are controlled by hereditary factors.

CHAS. H. RICHARDSON.

Acclimatization as a factor affecting the upper thermal death points of organisms. M. H. JACOBS. *J. Expt. Zoölogy* 27, 427-42(1919).—The temp. coeff. for starfish larvae, 48 hrs. old, at temps. from 32 to 40° is approx. 2, as derived by the author's formula. For *Paramécium caudatum*, however, this value is more variable, often ranging from 3 above 40° to less than 2 below 40°. A method is given for the calcn. of the theoretical death point when the temp. is raised uniformly at a given rate. A comparison of this theoretical value with the observed death point will indicate whether acclimatization has occurred. Starfish larvae showed practically no acclimatization while *Paramécium* showed considerable. This amount of "surplus resistance" was detd. quant. for *Paramécium*. Generally, the slower rates of temp. increase were more favorable for

*Paramecium*, but more unfavorable for starfish larvae than the more rapid ones. It is suggested that further data on the upper thermal death points include exact statements as to the methods by which the temps. have been obtained as well as the times of exposure to the temps.

CHAS. H. RICHARDSON.

Temperature coefficient of the action of  $\beta$ -rays upon the eggs of *Nereis*. ALFRED C. REDFIELD AND ELIZABETH M. BRIGHT. *J. Gen. Physiology* 1, 255-9(1919).—The temp. coeff. of the action of  $\beta$ -rays from Ra upon the eggs of *Nereis* lies between 1.1 and 1.2 for a change of  $10^\circ$ ;  $\alpha$ -radiation was eliminated and the effect of  $\gamma$ -radiation was found to be negligible as compared with the action of the  $\beta$ -rays. This coeff. is of a magnitude characteristic of photochemical reactions.

C. H. R.

The experimental production of edema in larval and adult *Anura*. CHARLES F. W. MCCLURE. *J. Gen. Physiology* 1, 261-7(1919).—Edema is a common abnormality in frog larvae which can be produced experimentally by placing the 2- or 4-celled stage ova in solns. of KCN, acetone, butyric acid, EtOH, or by exposing them to the influence of radium. These edematous larvae are without exception characterized by the hypertrophy of certain tubules in the pronephros. A similar edematous condition was produced in toads (*Bufo lentiginosus*) which after the ureters had been ligated were kept in water. The progress of the edema appeared to be related to the extent and character of the abrasion produced in the tissues at the point of ligation and the state of congestion of the tissues resulting from ligation. It is believed the edematous condition in frog larvae is due to the failure of the tubules of the pronephros to function normally with the consequent accumulation of fluid in the body cavity and tissues. These observations do not bear out Fischer's view (Aedema and Nephritis, New York, 2nd Ed. 1915) that the cause of edema in the *Anura*, is due to an overproduction or accumulation of acids within the body which causes the tissues to take up water.

CHAS. H. RICHARDSON.

Studies on bioluminescence. IX. Chemical nature of Cypridina luciferin and Cypridina luciferase. E. NEWTON HARVEY. *J. Gen. Physiology* 1, 269-93(1919); cf. C. A. 13, 241.—Luciferase is a protein or at least it is so closely associated with proteins that it cannot be removed without destruction; it is probably an albumin. It has sufficient properties in common with enzymes to be classed as an enzyme. Whole dried Cypridinae contain Fe, Cu and Mn, but it is not certain that these are concerned in the action of luciferase. Luciferin is probably a new, natural proteose, sol. in alc. and not digested by trypsin.

CHAS. H. RICHARDSON.

Nature of the retarding influence of the thymus upon amphibian metamorphosis. EDUARD UHLENHUTH. *J. Gen. Physiology* 1, 305-13(1919).—Thymus feeding sometimes retards and in rare cases inhibits metamorphosis completely in salamander larvae. The addition of normal food (earthworms) to the thymus diet prevented the inhibitory action of the thymus. A small quantity of iodothyryn added to the thymus diet led rapidly to precocious metamorphosis. The inhibitory effect of the thymus is not caused by a specific inhibiting substance in the thymus, but the absence from this gland of a substance required to develop the thyroid to the secretory state. The expts. were performed on the salamanders, *Ambystoma maculatum*, *A. opacum* and *A. tigrinum*.

CHAS. H. RICHARDSON.

Rate of recovery from the action of fluorite rays. W. T. BOVIE AND D. M. HUGHES. *J. Gen. Physiology* 1, 323-9(1919).—*Paramecium caudatum* was exposed to the influence of fluorite radiation, the intensity of the radiation being such that an exposure of 8 secs. produced cytolysis in 57% of the exposed organisms. The organisms were given two exposures of 4 secs. each, sepd. by an interval of varying duration. An increase in the length of the interval between the two exposures resulted in a decrease

in the percent. of cytolysed paramacia. The curve resulting from plotting the percentages of cytolysis as ordinates and the time intervals as abscissas corresponded with the curve derived from the monomolecular reaction formula  $X = X_0 e^{-kt}$ . The percentage of cytolysis increased with the length of exposure; the curve was practically a straight line. Cytolysis occurs when a certain amt. of a toxic photo-product is formed; recovery depends upon the removal of this toxic substance. A chemical process and diffusion are suggested as possible methods for its removal. C. H. R.

**Sensitization to heat due to exposure to light of short wave lengths.** W. T. BOVIE AND ALICE KLEIN. *J. Gen. Physiology* 1, 331-6(1919).—When *Paramecium caudatum* was exposed to fluorite rays for 4 seconds at 17-18° death did not result, but subsequent heating for 60 seconds at 16-17° resulted in a 10% mortality. Heat alone at the same temp. and duration was not fatal. Heating at 24-26° for 60 seconds, then exposing to the radiation for 4 secs. gave an 8% mortality, while subjection to the radiation followed by a temp. of 24-26° for 60 min. caused a 66% mortality. The % of recovery increased with the increase in the interval between radiation and subjection to temp.; with a period of 1/2 hr., the percent. of death was 20, while with a five hr. period it was 0. The death of *Paramecium* following fluorite radiation is a destruction by heat, the organism having been sensitized to heat in such a way that it can no longer endure normal optimum temps. No theory of the action of rays can be complete which does not take heat sensitization into account. CHAS. H. RICHARDSON.

## 12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

**Estimation of lactose in admixture with sucrose and invert sugar.** J. GROSSFELD. *Z. Nahr.-Genussm.* 35, 249-56 (1918); *Physiol. Abstracts* 4, 404.—Formulas are given for the calcn. of lactose from the optical activity of the mixt. E. J. C.

**Utilization of grape-seed in California.** PAUL SERRE. *Compt. rend. acad. agr. France* 5, 150-1(1919).—In California 550 tons of sirup, 340-350 tons of oil, 330-440 tons of tanning ext. and 1600-2000 tons of cattle feed are annually recovered from grape seed. This industry is dependent on wine-making. The grape sirup is obtained by simple maceration and subsequent concn. The oil, used by painters and soap mfrs. as well as to adulterate olive oil, is extd. by means of hydraulic presses with the application of heat. A small proportion is extd. by means of benzine or CS<sub>2</sub>. The oil cake is treated with H<sub>2</sub>O in special kettles in order to make a tanning ext. which is concd. to a pasty state and then dried in the air. The residue forms a cattle feed. ALBERT R. MERZ.

**Wartime vegetable oils (KLIMONT) 27.** Publications on military sanitation (STRUNK, MATTHES, et al.) 7.

KAMPEN, G. B. VAN: De voornaamste krachtvoedermiddelen. Hun rationeele aankoop en gebruik, benevens kerkomst en samenstelling. Groningen-Den Haag: J. B. Wolters. 116 pp. f. o. 90. For review see *Chem. Weekblad* 16, 129(1919).

KAMPEN, G. B. VAN: Crisis-voedermiddelen. Groningen-Den Haag: J. B. Wolters. 81 pp. f. o. 90. For review see *Chem. Weekblad* 16, 84(1919).

SPRIGGS, E. I.: Food and How to Save it. London: Government. 2nd Ed. 52 pp. For review see *Expt. Sta. Record* 39, 367(1918).

WILEY, HARVEY W.: *Beverages and their Adulteration. The Origin, Composition, Manufacture, Natural, Artificial, Fermented, Distilled, Alkaloidal and Fruit Juices.* Philadelphia: P. Blakiston's Son & Co. 421 pp. \$3.50.

**Assimilable organic phosphorus compound from vegetable foodstuffs.** M. GIRARD. U. S. 1,290,971, Jan. 14. The pat. relates to the obtainment in a purified condition of the org. compd. contained in most vegetable foodstuffs such as seeds or oil-cake (obtained by Posternak) and usually considered to be a salt or mixt. of salts of an "anhydro-oxyethylene-diphosphoric acid" having the assumed formula  $C_2H_2P_2O_6$ . 450 kg. of a 30% paste of the tetrabasic insol. Ca salt of the org. P compd. are dissolved in 60 kg. of 30% HCl to effect conversion into the sol. dibasic Ca salt. The brown and somewhat malodorous product is mixed with 0.5 kg. animal charcoal, well stirred for about a half hr., filtered and the Ca, which is not combined with the P compd., is pptd. by addition of oxalic acid. Ca oxalate formed is filtered out and the dibasic salt of the organic P compd. is pptd. from the filtrate by the addition of alc., washed and dried. It is obtained as a dazzling white, odorless and tasteless powder. The animal charcoal may be replaced by 2.5 kg. of siliceous marl. The purified product contains 22.4% P.

**Food for animals.** A. E. BROMLEY. Brit. 121,568, May 27, 1918. A food for animals having tonic properties comprizes cattle meal, preferably consisting of maize, meal, salt, Epsom salts, saltpeter, ginger, black antimony, flowers of S, fenugreek,  $NaHCO_3$ , liquorice, aniseed, linseed meal, charcoal powder, Peruvian bark, and gentian root. The mixt. may be used alone or mixed with other food or drink. The specification gives the proportions in which the ingredients are to be mixed.

**Food for animals.** G. W. LENSVELT. Brit. 121,586, Sept. 13, 1918. Cake for cattle is manufd. from yellow mustard seed by crushing it, steaming it to remove allyl mustard oil, drying it, and finally pressing it in the ordinary way to expel fatty oil and form cakes.

**Preserving grain, seeds, nuts, etc.** J. W. C. HAMILTON and E. W. QUIRK. Brit. 121,650, Jan. 10, 1918. Grain, seeds, nuts, etc., are sterilized by treatment with the vapor of HCHO or paraformaldehyde. The seeds, etc., to be treated are passed through a mixer by screw conveyors in the opposite direction to the course of the vapor, which enters by a pipe at a pressure of about 2 lb. per sq. in. and escapes by a relief valve. The seeds, etc., enter the app. by a hopper provided with a grid which sifts out stones, etc., and escape through an air-lock. The seeds in the hopper prevent the escape of vapor.

**Sterilizing milk or other liquids easily dissociated by heat.** O. LOBECK. Holl. 2,657, Oct. 15, 1918. Liquids such as serum, blood, hematogen, and the like, are heated quickly, through a series of intermediate temps., to not more than  $100^\circ$ , which is the sterilizing temp., and maintained at that temp. for several seconds.

**Flavoring fats.** J. DE BRUYN. Brit. 121,711, Aug. 12, 1918. A substance for imparting a special, especially a butter-like flavor, to edible fats or oils is made from oil-bearing seeds or fruits after removal of the oil. The defatted seeds are ground to a fine powder which is made into a smooth mixt. with  $H_2O$  contg. a small proportion of alkali. The mixt. is then treated with a proteoclastic enzyme, such as pepsin, and a culture of lactic bacteria, such as are used in butter-starters. The mixt. may, before treatment with enzyme and bacteria, be dried to a powder, which is mixed with  $H_2O$  and treated like the original mixt. when required for use. The skin and germ may be removed from the seeds before the sepn. of the oil. Cf. C. A. 13, 149.



## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**United States water laboratories in France.** EDWARD BARTOW. *Eng. News-Record* 82, 331(1919).—The duties of the lab. staffs include sanitary surveys of occupied areas; bacterial and chem. control of filter plants operated by the U. S. A.; industrial analyses of waters used in locomotives, laundries and airplane motors; and a comprehensive study of water supplied to troops in transit. FRANK BACHMANN.

**Color of water.** WILDER D. BANCROFT. Cornell Univ. *J. Franklin Inst.* 187, 249-71(1919).—A review of the literature. "The literature on the color of water is widely scattered; it appears not to have been read by anybody; and it is somewhat contradictory. It has, therefore, seemed desirable to collect the material in an accessible form as it constitutes an interesting chapter in the general subject of the colors of colloids." JOSEPH S. HEFURN.

**Tablets for the disinfection of drinking water.** B. FANTUS. *J. Am. Pharm. Assoc.* 7, 1034-8(1918).—Tablet triturates of chlorinated lime were prepared and assayed. The tablets weighed from 0.12 to 0.14 g. and contained 0.03 to 0.4 g. of available Cl. The tablets were sealed in tubes each containing 19 and the tubes kept for varying periods. At intervals a tube was broken and the tablets assayed for available Cl. In 4 mo. the loss in strength was about 40% and in 11.5 mo. 82.5%. Compressed tablets weighing about 0.105 g. were prepared from 30%  $\text{CaCl}_2\text{O}$ , using NaCl and weaker  $\text{CaCl}_2\text{O}$  as excipient. After assay, these were stored in the dark in a well stoppered bottle and from time to time some were removed for assay. The loss in available Cl was about 10% of the initial strength per mo., but the rate decreased with age. F. notes that the deterioration is in effectiveness rather than in quality since in 6 mo. the tablets would still be as useful as ever to disinfect perhaps half the quantity of infected  $\text{H}_2\text{O}$ . Tablets of  $\text{CaCl}_2\text{O}$  require about 30 minutes to disinfect water. If a little citric acid be added to the water the time is reduced to 10 min. The water also tastes better if citric acid be used. "Halazone" (*p*-sulfonedichloroaminobenzoic acid) slowly yields available Cl when in soln. The product is harmless to the higher animals. "Halazone" tablets were found to be stable after 3 mo. storage. L. E. WARREN.

**Find cause of obnoxious tastes in Milwaukee water.** H. P. BOHMANN. *Eng. News-Record* 82, 181-2(1919).—Investigation proved that coal-tar derivs. from coke and phenol plants produced taste when dild. 1 part in 500 million. Tastes were noticeable in the supply only when south and southwest winds were blowing. The source of the waste containing coal-tar derivs. was traced to manufacturing plants discharging waste into the lake. Combination of Cl, used as disinfectant for the water supply, with these derivs. imparted obnoxious tastes to the supply. FRANK BACHMANN.

**Water supply.** P. A. A. F. EIJKEN AND B. C. P. JANSSEN. Batavia. *Geneesk. Tijdschr. v. Ned.-Indië* 58, 149-56; *Chem. Weekblad* 15, 1362(1918).—Discussion and comparison of analyses of water from 18 possible sources of supply for Batavia. These are chiefly artesian wells at Batavia and springs at Buitenzorg. The supply is more than sufficient for the calcd. requirements as far ahead as 1935. JULIAN F. SMITH.

**Philippine water-supplies get strict sanitary supervision.** GEORGE W. HEISE. *Eng. News-Record* 82, 238-40(1919).—The govt. encourages wells by paying  $\frac{2}{3}$  of cost. Surface water supplies are dangerously contaminated. The death rate has been reduced 50% by use of good water. FRANK BACHMANN.

**Remarks concerning "the occurrence of hydrogen selenide in rain and snow."** P. KARRER. *Helvetica Chim. Acta* 1, 499(1918); cf. Gassmann, *C. A.* 12, 2033.—K. has repeated the expts. of G. and concludes that Se is not present in snow or rain. E. J. C.

**Design and operation of Fort Meyer, Virginia, sewage-treatment plant.** LEONARD S. DORN. *Eng. News-Record* 82, 244-6(1919).—The plant consists of a one-story septic tank, dosing chamber and sprinkling filter. It was designed for a population of 2,000 and cost \$8,000. Av. flow was approx. 47 gal. per capita. Tests show the raw sewage to contain: grease 115, total solids 1169, suspended matter 571 parts per mil. An av. detention period of 4½ hrs. removed 72% of suspended org. matter. The filter operated at rate of 30,000 population per acre. Stability was always obtained. Sludge is disposed of in trenches where it is allowed to dry.

FRANK BACHMANN.

**War's influence on the garbage pail.** F. C. BAMMAN. *Eng. News-Record* 82, 373-8(1919).—The amt. of garbage collected during 1918 averaged about 10% less than that collected in 1917. The grease content of 1918 averaged 18% less than in 1917 and 25% less than in 1916. Grease recovered was 28% less than in 1917. Changes to feeding during the year totaled 40, some being cities over 10,000 population; changes to reduction totaled 3. The amt. of garbage still wasted is sufficient to produce more than 30 million lbs. of grease, 60,000 tons of fertilizer tankage and 40 mil. lbs. pork.

FRANK BACHMANN.

**Shipping board protects health of shipyard men.** PHILIP S. DOANE. *Eng. News-Record* 82, 422(1919).—The creation of a department of health and sanitation by the U. S. Shipping Board gave protection to men in yards through control of food and, water supply, sewage and garbage disposal and abatement of flies and mosquitoes.

FRANK BACHMANN.

**American engineer at Burma camp fights epidemics.** HARRY N. JENKS. *Eng. News-Record* 82, 339-40(1919).—Guards were placed around the camp to keep out stragglers. Uncooked foods in infected areas were destroyed. A detention camp on the railroad line proved effective. Influenza, plague and cholera were the diseases combated during a 6 mo. period.

FRANK BACHMANN.

**Sanitary engineers get direct results in East Indian mining camp.** HARRY N. JENKS. *Eng. News-Record* 82, 172-5(1919).—Results obtained at Burma Mines, Namtu, Burma. Intensive clearing and drainage in mosquito control was done utilizing cheap labor instead of oiling. Water supply was derived from springs in swamps. Human excreta are disposed of by latrine system. In Namtu proper the wet pail system is used with final deposit in latrines. Bath house water and kitchen sink waste are discharged onto the ground and flows down the hillside through ditches. F. B.

**Vehicular tunnels under the Hudson River.** MARTIN SCHREIBER. *J. Franklin Inst.* 187, 273-88(1919).—The ventilation of the proposed vehicular tunnel under the Hudson River between Jersey City and Manhattan Island is described. A résumé is given of ventilation tests (including air analyses for unsatd. hydrocarbons, CO, CO, O, and N) conducted in an air-tight exptl. chamber, which had exactly the same cross section as the proposed tunnel, was provided with a similar ventilating system, and contained automobiles with engines in operation.

JOSEPH S. HEPBURN.

BADO, ATELIO A., BERNAOLA, VICTOR J., MAZZA, AURELIO F. AND DASSO, SR. LEOPOLDO: *Métodos de análisis de aguas adoptados en el laboratorio de las Obras Sanitarias de la Nación*. Bueno Aires: Official Publication. 98 pp. For review see *Anales soc. quim. Argentina* 6, 548(1918).

BARTHE: *Recueil des travaux du leonseil départemental d'hygiène de la Gironde pendant l'année 1917*. Bordeaux, France: M. Ragot, 11, 13 Rue de la Bourse. For review see *Repert. pharm.* 30, 59(1919).

BESSEM, J.: *Kunstmatige besproeiing en afvalwater-reiniging*. Brochure

uitgegeven door de Nederlandsche Heidemaatschappij bij J. Zomer te Wageningen. For review see *Chem. Weekblad* 16, 90(1919).

BROADHURST, JEAN: *Home and Community Hygiene*. Philadelphia and London: J. B. Lippincott Co. 428 pp. \$2.00. For review see *Am. J. Public Health* 8, 932(1918).

FISCHER, BERNHARD: *Kurzgefaszte Anleitung zu den wichtigeren hygienischen und bakteriologischen Untersuchungen*. Dritte, wesentlich umgearbeitete Auflage von Dr. Karl Kiskalt. Berlin: August Hirschwald, Unter den Linden 68. 231 pp. M. 11 + 20%. For review see *Chem. Weekblad* 16, 88(1919); cf. *C. A.* 4, 2860; 9, 944.

NASMITH, GEORGE G.: *The Fringe of the Fight*. New York: Geo. H. Doran Co. This book contains chapters on gas warfare and military sanitation of interest to chemists. For review see *Am. J. Public Health* 8, 932(1918).

The Passaic Valley Sewerage Case. Proceedings of the Supreme Court of the U. S., October term, 1916. 4600 pp. For review see *Am. J. Public Health* 8, 931(1918).

Preventing and removing boiler incrustation. J. URRUTY. *Brit.* 121,590, Nov. 8, 1918. A compn. for removing incrustation from condensers and boilers consists of  $\text{HCl}$ ,  $\text{CuSO}_4$ ,  $\text{NaHCO}_3$ ,  $\text{KCN}$ , and  $\text{H}_2\text{O}$ . The following mixt. is used to prevent incrustation: oak bark,  $\text{NaHCO}_3$ ,  $\text{Na}_2\text{AlO}_2$ , and  $\text{H}_2\text{O}$ .

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

Soil acidity as affected by moisture conditions of the soil. S. D. CONNER. *Ind. Agr. Expt. Sta. J. Agr. Research* 15, 321-31(1918); cf. *C. A.* 11, 3363.—Four different types of acid soils were kept at moisture condition, one-fourth satd., one-half satd., and fully satd., for a period of 1 yr. The change in acidity was detd. by three methods: the Jones  $\text{Ca}(\text{OAc})$ , method, the Hopkins  $\text{KNO}_3$ , method, and the ethyl acetate method. The results from the 3 methods agreed well and showed that all the types of soils, when kept one-half satd., increased in acidity and the same was generally true for the one-fourth satd. samples, although the acidity was lower. Of the fully satd. soils those high in org. matter developed considerable acidity while those low in org. matter showed no gain and often a loss in acidity. When the samples were air-dried before the detn., those which had been kept fully satd. showed a loss in acidity. The  $\text{KNO}_3$ , exts. of the fully satd. soils contained much more Fe and Al than those having a lower moisture content, the Fe being in the ferrous state. R. N. HARGER.

Limestone action on acid soils. ROBERT STEWART AND F. A. WYATT. *Urbana. Ill. Agr. Expt. Sta., Bull.* 212, 267-96(1919).—The annual loss of limestone from soils depends upon a number of factors among which are the kind, the form and the amt. added. It is shown that the loss of limestone is not as large as is generally assumed. As an av. of all detns., the annual loss from the surface 20 inches was 760 lbs. per acre from one field and 542 lbs. per acre from another. It would thus appear that for the common prairie land of southern Illinois an application of 1 ton per acre of limestone once in 3 or 4 years is sufficient to keep the soil alk., or sweet, after the initial acidity has been destroyed by heavier applications. Dolomitic limestone can be used successfully on acid soils. It is slightly more effective than high-Ca limestone in neutralizing the soil acidity, is more durable, and has no injurious effects on the soil crops. No evidence was secured as a result of 4 years' work that finely ground limestone is more effective in correcting soil acidity than is the total product from a  $1/4$ -inch screen

which contains both the finer material for immediate use and the coarser material for greater durability. Limestone applied to the surface slowly penetrates into the subsurface, but does not seem to have any effect upon the acidity of the subsoil. The amt. of native limestone found in the subsoil is a variable quantity. In some cases there is none present even at a depth of 40 inches, whereas in other cases it extends upward even slightly into the subsurface. The results obtained give evidence that chem. analysis may be depended upon to measure the acidity of the soil, the reduction of acidity due to the action of limestone applied, and also to find the limestone still remaining in the soil, whether from the applications made or from a supply native to the soil.

W. H. ROSS.

**The effect of heat on the lime requirements of soils.** H. A. NOYES. *Purdue Univ. Agr. Expt. Sta. J. Am. Soc. Agron.* 11, 70-1(1919).—In the detn. of the acidity of the soil by the Veitch method the sample is first treated with dil. lime water, and the mixt. then evapd. to dryness on the steam bath. It is now shown from an examn. of samples of soil collected at different depths and in different places that reactions take place in the soil at the temp. of the steam bath that do not take place when the soil and water mixt. is not heated. The Veitch detn. gives the reaction between soil, water and  $\text{Ca}(\text{OH})_2$  at steam bath temp., but it is held that this does not represent the lime requirement of the soil at ordinary temps.

W. H. ROSS.

**A chlorine index as a comparative measure of the richness of earths in humus.** L. LAPICQUE AND E. BARBÉ. *Compt. rend.* 168, 118-21(1919).—The oxidation of humus by  $\text{NaOCl}$  was used to det. the relative amts. of humus in soils. Ten cc. of earth are shaken in a flask with 50 cc. of a  $\text{NaClO}$  soln. (Eau de Javel) at intervals during  $\frac{1}{2}$  hr. Two cc. of the supernatant liquid are dild. with 50 cc.  $\text{H}_2\text{O}$  and titrated with thiosulfate after addition of 5 cc. of a 20%  $\text{KI}$  soln. and 2 cc.  $\text{HCl}$  (using starch as indicator). The difference between the result obtained and that obtained with 2 cc. of fresh hypochlorite soln. multiplied by 2.5 gives the vol. of active  $\text{Cl}$  withdrawn by 1 cc. of earth ( $\text{Cl}$  index). A table is given showing the indices obtained with soils from various sources.

ALBERT R. MERZ.

**Nitrogen relations of certain crop plants when grown alone and in association.** R. C. WRIGHT. *Bur. Plant Ind. J. Am. Soc. Agron.* 11, 49-66(1919).—A study was made of the behavior of representative field crops when grown alone and in combination with other crops. In the first season's expts. the non-legumes barley, rye, oats, and kafir were each grown in the same soil with one of the legumes, vetch, field peas and red clover; corn was also grown with oats and millet. The soil used in the expts. was contained in large galvanized iron buckets holding 45 kg. of moist soil. When 2 species of plants were grown in association, half the number of plants of each were used as when grown alone. Crops were grown to maturity and harvested close to the ground. When account was taken of the  $\text{N}$  occurring in the soil and in the plant after harvesting, it was found that there was a distinct loss of  $\text{N}$  when barley was grown with peas, rye with peas or clover, and corn with millet. There was a gain in  $\text{N}$  when barley was grown with vetch or clover, oats with peas or clover, and kafir with vetch. In general, when barley and vetch or clover, oats and vetch or peas, and kafir and vetch were grown together, although more dry matter and  $\text{N}$  were produced, not so much  $\text{N}$  was removed from the soil as when these crops were grown alone. Oats and kafir gained in percentage of  $\text{N}$  when grown with vetch, peas or clover, and corn lost with both oats and millet. All other crops gained in percentage when grown with some crops, and lost with others. Similar expts. were repeated the following season, using 3 types of soil from the states of California, Kansas and Virginia. Oats, barley and kafir were used as the non-legumes, and soy beans and purple vetch as the legumes. For each of the combinations there was found to be a gain of  $\text{N}$  during the growth of the crop in one

or more of the soils, and a loss in the others. Oats and kafir when grown with vetch, and soy beans when grown with oats or barley, gained in percentage of N in all soils; while barley with soy beans, and vetch with barley or kafir lost in all soils. Other combinations gained in some soils and lost in the others. W. H. ROSS.

**Influence of higher plants upon bacterial activities in soils.** T. L. LYONS. *J. Am. Soc. Agron.* 10, 313-22(1918).—An address delivered before the 11th ann. meeting of the Am. Soc. of Agron., Jan. 6, 1919. J. J. SKINNER.

**Farm practice in growing sugar beets in Michigan and Ohio.** R. S. WASHBURN, L. A. MOORHOUSE, T. H. SUMMERS AND C. O. TOWNSEND. U. S. Dept. Agr., *Bull.* 748, 45(1919).—The general subject of sugar beet growing, soil requirement, cultivation, and development of the industry is considered. J. J. SKINNER.

**Fertilizer experiments on sugar cane.** W. E. CROSS. *Rev. ind. agr. Tucuman* 9, 72-85(1919).—A new series of fertilizer expts. on Java canes, in which  $K_2SO_4$ , Thomas slag or phosphate and  $(NH_4)_2SO_4$  were used, each one by itself, on limed and unlimed land, showed that neither K nor P increased the yield of cane or sugar. The phosphate on unlimed land delayed maturity of the cane.  $(NH_4)_2SO_4$  gave a definite increase in all cases, which was, however, unprofitable in three cases out of four. F. W. ZERBAN.

**The value of manure on Indiana soils.** A. T. WIANCKO AND S. C. JONES. *Purdue Agr. Exp. Sta., Bull.* 222, 20(1918).—A rept. is made of field expts. with manure on several soil types in different parts of the state. In a rotation of corn, wheat and clover, manure added in amts. of 10 tons per acre in the rotation produced, on the limed Volusia silt loam, an increase of 20.2 bushels of corn per acre, 9.6 bushels of wheat and 755 lbs. of hay. On a limed gray-white silt loam soil the manure produced an increase of 25.7 bu. of corn, 8.2 bu. of wheat and 400 lbs. of hay per acre. On the limed Knox silt loam there was an increase of 7.5 bu. of corn, 4.5 bu. of wheat and 1147 lbs. of hay per acre. Data are given showing the effect of manure in different crop rotations. Relatively larger returns were secured with 8.5 tons per acre than with 1.4 tons. The use of phosphate with manure is recommended for the soils under consideration. J. J. SKINNER.

**Calcium arsenite and arsenate as insecticides.** E. B. HOLLANDER AND J. P. BUCKLEY. *J. Econ. Entomology* 11, 354-7(1918).—The scarcity of Pb arsenate will bring into the market cheaper and less reliable arsenicals, such as  $Ca(AsO_3)_2$  and  $CaH_2AsO_4$ . Ca arsenite is fairly sol. in  $H_2O$ , but practically insol. in excess of  $Ca(OH)_2$ . It contains 77.92%  $As_2O_3$ . In spraying tests, however, some foliage injury occurred even when the  $Ca(AsO_3)_2$  soln. was mixed with 3% milk of lime. Calcium hydrogen arsenate was prepared from molar solns. of pure  $CaCl_2$  and pure  $Na_2HASO_4$ , using 10% excess of the latter. The mixed solns. were heated slowly to 95° with agitation, cooled, filtered on a Büchner funnel, washed free of  $Cl^-$ , dried at a low temp. and weighed. The yield was 86%. One mixed sample, prepared in the laboratory, gave the following on analysis:  $CaO$ , 28.344%;  $As_2O_3$ , 58.025%; water of combination, 13.646%. The water-sol. As expressed as  $As_2O_3$  was 44.82%; in lime water soln. the solubility of As as  $As_2O_3$  was 0.17%. CHAS. H. RICHARDSON.

**Blossom spraying and bee poisoning.** JAMES TROOP. *J. Econ. Entomology* 11, 433(1918).—In the lab. 0.000005 g.  $As_2O_3$  was the minimum fatal dose for bees. The field work so far completed indicates that bees may be killed by a poisonous spray at blossom time. The investigations are being continued. CHAS. H. RICHARDSON.

**Plants used as insecticides.** R. C. ROARK. *Am. J. Pharm.* 91, 25-37, 91-107(1919).—A compilation of data. W. G. GAESSLER.

**Attacks of insects on cinchona, tea, etc.** M. KERBOSCH AND CH. BERNARD. *Batavia. Mededeelingen van het Kinaproefstation* IV(1918); *Pharm. Weekblad* 56, 73

(1919).—A description, illustrated with colored plates, of the effects of the red cinchona mite (*Tetranychus bimaculatus*) and the red, orange and yellow tea mites (*Tetranychus bimaculatus*, *Brevipalpus obovatus* and *Tarsonymus translucens*) on cinchona and tea plants. As insecticides,  $(\text{NH}_4)_2\text{SO}_4$  is harmful to the plant, and tobacco ext. is very ineffective. An aq. ext. of the fruit of *Sapindus rarak*, containing a saponin, would be effective but for its extremely slow action. Best results were obtained with S powder. No expts. with HCN are recorded.

JULIAN F. SMITH.

The mode of action of contact insecticides (MOORE) 11L. Fumigation with chloropicrin (MOORE) 11L. Rational utilization of dead animals (FRABOT) 27.

**Insecticide and fungicide.** P. R. JONES. U. S. 1,291,013, Jan. 14. An insecticide and fungicide is formed of 1.5–3 gals. of an emulsified mineral oil containing a small proportion of cresol soap, 5–15 gals. "lime-sulfur soln.," 8–24 oz. of ground glue and 100–200 gals. of  $\text{H}_2\text{O}$ . Bordeaux mixt. may be used instead of "lime-sulfur soln."

**Insecticides.** R. RASMUSSEN. Brit. 121,690, Apr. 23, 1918. An insecticide or disinfectant for the prevention and cure of stem-rot or American canker upon tomatoes and other plants grown under glass and for the extermination of red spider and wire-worm, consists of a mixt. of two parts of bitter aloes with one part of alum and a quarter part of rock salt by wt. Proportions are stated for the diln. of the mixt. according to use.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

**New modes of employment of the Mucedineae in agricultural industries.** P. BAUD. *Chimie et industrie* 1, 699–707 (1918).—Although the distilleries of the North and of Pas-de-Calais were in the hands of the Germans, the production of alc. in 1916 reached 665,232 hl., against 880,821 in 1912. A part of this excellent showing was due to the employment of "mucors" in place of the old style methods (cf. Boulard, *C. A.* 13, 246). The yields from the old process of malting compared with the yields in which mucors are used show an advantage of 14 to 19% in favor of the latter. The transformation of starch into fermentable sugars by treatment with mineral acids gives products yielding a smaller percentage of alc. than by the malting method, and in addition renders the by-products of the industry unfit for cattle food. The origin, structure, and morphology of the Mucedineae, especially "type mucor Boulard No. 5," are described and illustrated with 12 photomicrographs. The technical application of mucors to the manufacture of alc. is given in detail, including a lay-out of the app. on a factory scale. The mucor process is practicable in the first stage of the vinegar industry.

L. W. RIGGS.

Utilization of grape-seed in California (SERRE) 12.

**Distilling alcohol, etc.** SOC. E. BARBET ET FILS ET CIE. Brit. 121,797, June 10, 1914. Addition to 14,041, 1914. The app. specified in the principal patent, for the continuous distn. and rectification of wines and musts, is modified so that it may be transformed at will into a continuous app. for rectifying phlegms.

**Dry wort.** J. G. Ø. MAARDT. Dan. 23,446, Sept. 2, 1918. Sugar and hops are mixed and heated until the mass is caramelized. The hops impart an aroma to the product.

**Beverage.** P. C. SOYEZ. U. S. 1,291,219, Jan. 14. A non-intoxicating beverage is formed by fermenting an infusion of ash-tree leaves containing sugar and tartaric acid, with yeast, and incorporating it with water and chicory to give the desired dilution and a bitterness and color resembling that of beer.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

**Addition of hypochlorous acid to terpineol.** SLAWINSKI. *Chemik. Polski* 15, 97-105(1917); *Perfumery & Essential Oil Record* 10, 19.—When terpineol is dissolved in AcOH and treated with NaClO soln. (1%) 2 products are formed which can be sepd. by fractional crystn. Both consist of the chlorohydrin of 1,2,8-menthanetriol. The first m. 114-115° and b<sub>18</sub> 162-5°; the second m. 60-80° and b. 125-55°. The crude substance, when treated with KOH (20%), yields a product which seps. into a liquid and a solid portion, m. 118-118.5°. The former, on distn., yields small quantities of pinol and pinol hydrate, which could only be derived from the *cis*-chlorohydrin of 1,2,8-menthanetriol. From the fraction b<sub>18</sub> 175-80° it is possible to isolate *cis*-1,2,8-menthanetriol, m. 118-118.5°. The chlorohydrin of menthanetriol, m. 114-115°, yields almost exclusively pinol hydrate when treated with KOH (20%), so that the Cl atom must be attached to the C atom in position 6. From the mixt. of chlorohydrins, m. 60-80°, only small amts. of the menthanetriol, m. 116-117.5°, could be isolated. The glycerol compd. is, therefore, formed from the chlorohydrin of lower m. p.

E. J. C.

**Effect of morphine concentration on the boiling point method of morphine estimation.** H. E. ANNETT AND H. SINGH. *Analyst* 44, 41-3(1919).—In preliminary tests with quantities of 1 g. and upwards of cryst. morphine, the B. P. method gives accurate results. When only 0.25 g. of cryst. morphine was taken, the method gave low results. Since 8 g. of opium are taken in the B. P. 1914 method, 0.25 g. morphine would correspond to an opium of less than 3% amorphous morphine content. Samples of moist opium well mixed with varying amts. of starch gave results for morphine considerably below the truth. The error of the B. P. 1914 method is stated to be 0.5% morphine either way, in view of which it is concluded from expts. involving reduced quantities of opium and proportionately reduced quantities of reagents that useful results can be obtained by analyzing opium samples when only 4 g., or even 2 g., of the sample are available.

W. O. E.

**Liquor sodae chlorinatae, B. P.** R. C. COWLEY. *Chemist Druggist* 91, 49(1919).—The amt. of Na<sub>2</sub>CO<sub>3</sub> directed by the British Pharmacopeia to be used in the prepn. of soln. of chlorinated soda is insufficient to ppt. the whole of the CaO in soln. and the use of a sufficient quantity for this purpose produces an excessive alkalinity. The following method will allow for variations in the compn. of com. bleaching powders and will produce an approx. neutral soln.: Triturate 50 g. bleaching powder with 500 cc. H<sub>2</sub>O, set aside in a bottle 12 hrs., shaking well occasionally; filter and make up to 500 cc. (A). Dissolve 200 g. cryst. Na<sub>2</sub>CO<sub>3</sub> in H<sub>2</sub>O and make up to 1 l. (B). To 20 cc. of A add 20 cc. dil. HCl, boil to expel Cl, neutralize to Me orange with B, boil to expel CO<sub>2</sub>, and neutralize to phenolphthalein. From the amt. of B required for the 2nd titration the amt. necessary to add to the remaining 480 cc. of A can be calcd. Add the requisite amt. of B, put aside to settle, then filter. The amt. of NaClO in the filtrate should be detd. by the alk. As<sub>2</sub>O<sub>3</sub> method and the strength adjusted to 0.5% wt./vol.

C. O. EWING.

**Assay of theobromine-sodium salicylate.** BAYER. *Pharm. Post* 51, 558(1918); *Schweiz. Apoth.-Ztg.* 57, 36(1919).—Dissolve a 1-g. sample in 10 cc. H<sub>2</sub>O and sat. with

CO<sub>2</sub>. The pptd. HOC<sub>4</sub>H<sub>7</sub>COOH is collected on a tared filter, dried at 100° and weighed. The wt. should not be less than 0.4 g. C. O. EWING.

**Assay of hypophosphites.** BAYER. *Pharm. Post* 51, 335(1918); *Schweis. Apoth.-Ztg.* 57, 35(1919).—Dissolve 20 g. Ca<sub>3</sub>P<sub>2</sub>O<sub>8</sub> in H<sub>2</sub>O and make up to 100 cc. Heat 10 cc. of this soln. on a H<sub>2</sub>O bath with 20 cc. 0.1 N alk. KMnO<sub>4</sub>, cool, acidify strongly with H<sub>2</sub>SO<sub>4</sub>, add a crystal of KI and titrate the liberated I with 0.1 N Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. Not more than 11 cc. should be required, corresponding to a 90% content of Ca<sub>3</sub>P<sub>2</sub>O<sub>8</sub>.

C. O. EWING.

**Detection of formic acid in acetic acid.** BAYER. *Pharm. Post* 51, 393(1918); *Schweis. Apoth.-Ztg.* 57, 35(1919).—The test depends upon the reaction HCOOH + Br<sub>2</sub> → CO<sub>2</sub> + 2HBr. To a soln. of 2–3 g. AcONa in 10 cc. H<sub>2</sub>O. Br water is added until a yellow color is produced, followed by 1–2 cc. of the AcOH to be tested. If HCOOH is present the yellow color disappears; if absent, the color is intensified. The test will detect 0.1% of HCOOH.

C. O. EWING.

**Assay of formaldehyde, hexamethylenetetramine and formalin pastilles.** SRÖWA. *Pharm. Zentralhalle* 59, 27(1918).—See C. A. 9, 952.

E. O. EWING.

**Hyoscyamus niger.** GZO. P. KOCH. *Am. J. Pharm.* 91, 68–82(1919).—Expts. are described on germination of *H. niger* seeds and results are also given of fertilizer and insecticidal tests. Plants of *H. niger* may easily produce 23 grams of seed. The alkaloid content of green hyoscyamus leaves plus seed pods, collected when most of the seed pods had formed, varied in % of mydriatic alkaloids from 0.073 to 0.102. The roots plus the stems contain 0.81% of mydriatic alkaloids. Dry leaves of *H. niger*, collected after harvesting the mature seed, had an alkaloid content varying from 0.057 to 0.065%. Hence, the alkaloid content of the leaves when taken from the plants, when mature and dry, is considerably less than that of those taken from the plants when green. The mydriatic alkaloid content of the stems of the dry plants collected after harvesting the mature seed was from 0.052 to 0.057%. The stems, collected when the plants are green, can probably always be utilized in conjunction with the leaves without failing to meet the total alkaloid requirement of the U. S. P. of 0.0065%.

W. G. GAESSLER.

**The so-called cold process for official soaps.** F. M. JORDAN. *Am. J. Pharm.* 91, 83–5(1919).—J. recommends the following cold processes which yield products in every way meeting the official requirements: *Linimentum saponis mollis* (tincture of green soap): Dissolve 55.90 g. of KOH in 180 cc. of water, and, while still hot, add 279.50 g. of cottonseed oil. Add 180 cc. of alc. and stir or agitate the mixt. until a clear liquid soap results, which should be in about 10 min. Allow to stand for 1 hr., add sufficient alc. thoroughly to liquefy, about 200 cc., and 112.50 cc. of water. Now add 20 cc. of oil of lavender and sufficient alc. to make the finished product measure 1000 cc. Allow to stand 1 week and filter. *Linimentum saponis* (soap liniment): To 53 g. of olive oil, contained in a suitable vessel, preferably of glass, add a soln. of 7 g. of NaOH in 25 cc. of water. To this mixt. add 25 cc. of alc. and agitate the contents of the vessel until sapon. is complete and the mass becomes clear, gelatinous and semi-solid. Let stand 1 hr. or longer. Dissolve 45 g. of camphor and 10 cc. of oil of rosemary in 675 cc. of alc., add to the soap just prepared, and, if necessary, add sufficient water to make the finished product measure 1000 cc. Finally mix thoroughly. *Liquor cresolis compositus* (compound solution of cresol): To 40 g. of NaOH, which must be of full strength, contained in a suitable tared vessel, add 150 cc. of water and stir until soln. has been effected. While still hot, in a thin stream and under const. stirring, add 300 g. of linseed oil. Continue the stirring until the mass acquires the appearance and consistency of an emulsion and set aside, without further stirring, for 12 hrs. or over.



night. To the soap thus formed add 500 g. cresol and sufficient water to make the finished product weigh 1000 g. and stir the mixt. until complete soln. has been effected, which may be hastened, if desired, by the application of gentle heat. NaOH of less than full strength may be used provided its actual strength be taken into account.

W. G. GAESSLER.

Review of the work on essential oils and their constituents in 1914 and 1915.

ANON. *Rev. gén. chim.* 20, 54-65, 70-83(1917); 21, 3-8(1918).

E. H.

A study of cinchona seeds. ANON. *Mededeelingen van het Kinaproefstation V* (Part B); *Pharm. Weekblad* 56, 73-4(1919).—This study includes the influence of temp. and of methods of sampling on the analysis of cinchona seeds. Studies on germination showed that moisture is very harmful. Failure of government seeds, however, is more often due to mites than to moisture. The secrecy practiced by many analytical labs. is severely criticized. (Part A of number V contains the report of the Cinchona Expt. Sta. for 1916-17.)

JULIAN F. SMITH.

Preparation and preservation of powdered myrrh which gives Bonastre's reaction. CHRISTENSEN. *Arch. Pharm. Chemie* 1918, 230-4, 245-53; LOFF, *Ibid* 1918, 265-7; *Schweiz. Apoth.-Ztg.* 56, 665-6(1918).—A Danish prize problem to det. whether powdered myrrh can be readily prepd. or kept so as to retain the property of giving Bonastre's Br test, eventually modified. C. crushed 300 g. of myrrh finely and left it over CaO for 2 weeks. After sieving it was dried again for 2 weeks, then powdered and passed through a fine sieve. It gave the test with Br and with HNO<sub>3</sub>. When kept in filled and corked vessels in the dark, the test was positive after 10 months, while in partly filled, glass-stoppered vessels kept in daylight, the test was faint after 6 and negative after 10 months. The same powder in contact with O in a well sealed bottle failed to give the test after 6 weeks, due to oxidation of the essential oil. C. obtained 8.76% of oil by distn. with steam, and 7.41% by extn. with petroleum ether. The consts. of the 2 oils were, resp.,  $d_{4}^{20}$  1.0132, 0.9664;  $n_D^{20}$  1.4979, 1.5140;  $[\alpha]_D^{20}$  -44.66;  $[\alpha]_D^{17}$  -50.03 (in Et<sub>2</sub>O), -49.79 (in CHCl<sub>3</sub>); b p. about 260°. It contained 80.82% C and 9.51% H. C. prefers Greenish's test of Germ. Pharm.V. L. finds Bonastre's test positive after prolonged contact of the powder with N in place of air, also that the oxidized oil is sol. in C<sub>6</sub>H<sub>6</sub> and CHCl<sub>3</sub>, not in Et<sub>2</sub>O, EtOH or CS<sub>2</sub>. He recommends that the Pharm. Danica replace Et<sub>2</sub>O by CHCl<sub>3</sub> in the test.

S. WALDBOTT.

Note on the U. S. P. assay for oil of peppermint. A. B. LYONS. *J. Am. Pharm. Assoc.* 8, 10-11(1919).—Mathematical discussion, which cannot be abstracted.

L. E. WARREN.

Research and the United States Pharmacopeia. A. H. CLARK. *J. Am. Pharm. Assoc.* 8, 13-6(1919).

L. E. WARREN.

Some variations in cinchona bark and its preparations. H. H. SCHAEFER. *J. Am. Pharm. Assoc.* 8, 11-3(1919).—The U. S. P. IX requires a standard of 5% of total alkaloids in cinchona. The U. S. P. VIII required 5% of total alkaloids but also specified 4% of ether-sol. alkaloids. Owing to restricted shipping facilities due to the war, much low-grade cinchona has been on the market during the last year or two. Some of this bark conformed to the U. S. P. IX standard but would not meet the requirements of the U. S. P. VIII in ether-sol. alkaloids. Five specimens assayed 5.32, 5.83, 6.01, 5.52 and 5.08% of total alkaloids while the ether-sol. results were, resp., 3.42, 2.92, 3.01, 2.98 and 2.67%. A number of market tinctures of cinchona were examd. to det. whether they had probably been made from such questionable bark. Most of the tinctures passed the requirements of both pharmacopeias. Three samples assayed 0.912, 0.954, and 0.983 g. of total alkaloids and, resp., 0.64, 0.59 and 0.49% of ether-

sol. alkaloids per 100 cc. Likewise a number of fluid exts. of cinchona were assayed by both standards. Three gave 4.61, 4.23 and 4.01 g. of total alkaloids and, resp., 3.20, 3.01 and 2.92 g. per 100 cc. of ether-sol. alkaloids. It is concluded that the standards of the U. S. P. IX are actually lower than those of the U. S. P. VIII. S. believes that both standards should be required. L. E. WARREN.

**Botanicals of the Blue Ridge.** C. O. EWING AND E. E. STANFORD. *J. Am. Pharm. Assoc.* 8, 16-26(1919).—Essay. L. E. WARREN.

**Couch grass versus Bermuda grass.** E. N. GATHERCOAL. *J. Am. Pharm. Assoc.* 8, 26-32(1919).—The two plants are compared from the historical, botanical, pharmacognostical, histological, chemical and therapeutical viewpoints. L. E. WARREN.

**Pharmacological assaying.** H. C. HAMILTON. *J. Am. Pharm. Assoc.* 8, 49-64(1919).—Historical and descriptive essay. L. E. WARREN.

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**Plants used as insecticides (ROARK) 15.**

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**BOUVET, MAURICE:** *La fabrication industrielle des comprimés pharmaceutiques.* Paris: J. B. Baillière et fils. For review see *Bull. sci. pharmacol.* 26, 44(1919) or *Repert. pharm.* 30, 58(1919).

**GADD, H. WIPPELL:** *A Synopsis of the British Pharmacopoeia, 1914, and of the Poison Laws of Great Britain and Ireland.* 10th Ed. London: Baillière, Tindall & Cox. 200 pp. 2s. net. For review see *Pharm. J.* 102, 103(1919).

**GONZÁLEZ, R.:** *Investigation of Chenopodium quinoa.* 2nd Ed. revized and enlarged. La Paz, Bolivia: R. González. 45 pp. For review see *Expt. Sta. Record* 39, 610(1918).

**VECCHIOTTI, LUIGI:** *I Preparati di ferro.* Bologna: Licinio Cappelli. 256 pp. L. 5.00. For review see *Boll. chim. farm.* 58, 18(1919).

**The Chemist and Druggist Diary for 1919.** 51st year of Publication. For review see *Pharm. Weekblad* 56, 77(1919).

**Nederlandsche Pharmacopoe Ed. IV, aanvullingen en ulzigingen III.** Gebr. Belinfante. For review see *Pharm. Weekblad* 56, 72(1919).

**Synthetic drugs and intermediate products.** ABBOTT LABORATORIES. *Brit.* 121,578, Apr. 12, 1918.  $\alpha$ -Bromoethyl *p*-nitrobenzoate is prepd. by reaction of  $C_6H_4Br_2$  on a salt of *p*-nitrobenzoic acid, preferably in the presence of an amine or finely divided Cu as catalyst. Ethylene di-*p*-nitrobenzoate is obtained as a by-product in the above process. (Diethylamino)ethyl *p*-aminobenzoate is obtained by condensing the above described bromo compd. with  $Et_4NH$  and reducing the product.

**Separating therapeutically active substances from food and organ extracts.** BOERHINGER & SOEHNE. *Holl.*, 2,600, Oct. 15, 1918. A ppt. is produced by phosphotitanic acid, and then treated with acetone.

**Tobacco.** K. ERSLEV. *Brit.* 121,598, Nov. 28, 1918. To improve inferior or ordinary tobacco and give it a flavor resembling Havana and other tobaccos of superior quality, it is treated with liquids in which fresh cultures of one or more of the following microorganisms have been cultivated: butyric ferments, aromatic lactic acid bacteria, ester-forming species of torula, ester-forming fungi. The tobacco leaves may be treated with the liquid bacteria cultures or products before or after fermentation. Culture liquids such as malt ext., milk, whey, saccharine solns., etc., may be used, or decoctions of leaves, blossoms, roots or aromatic vegetable substances, with sugar or feeding substances, for the cultivation of the microorganisms.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**Research organization in industrial works.** A. P. M. FLEMING. *Nature* 102, 454-7(1919).—A discourse in which suggestions are given for the establishment of industrial research labs. W. H. ROSS.

**Planning a works research organization.** A. P. M. FLEMING. *Electrician* 82, 118-20(1919); cf. preceding abstr. W. E. R.

**The organization of a factory library.** W. BARBOUR. *J. Soc. Chem. Ind.* 38, 37-40R(1919).—A system of classifying and indexing is described. E. H.

**Proposed university of technology.** HERBERT WRIGHT, *et al.* *Electrician* 82, 176, 178(1919).—Discussion of conditions in England today. C. G. F.

**The functions of the engineer: His education and training.** W. A. J. O'MEARA. *Electrician* 82, 198, 229(1919).—Among the points discussed is the need for the statutory control of the engineering profession, a control such as exists in the case of the medical and legal professions. C. G. F.

**Chemical industry in Turkey.** G. FÉSTER. *Rev. prod. chim.* 22, 39-42(1919). E. H.

**Some observations on sulfuric acid plants (new and old).** VIII. "P." *Gas World* 70, No. 1802 (Coking and By-products Sec.), 17-8(1919).—A review of some earlier methods for regenerating spent oxide and recovering S. J. L. W.

**Notes on the Bucher cyanide process for the fixation of nitrogen.** EUGEN POSNJAK AND H. E. MERWIN. *J. Wash. Acad. Sci.* 9, 28-30(1919).—Crude technical products of this process show some bearing constituent other than ordinary NaCN. Checking B.'s work, the authors obtained concordant results, confirming the reaction as given by him. Investigation of the chem. nature of the N-bearing material in the crude product is being continued. T. E. KRITT.

**The alunite problem.** W. F. DOWNS. *Eng. Mining J.* 107, 388(1919).—A general discussion in which the author points out that the recovery of  $K_2O$  and  $Al_2O_3$  from alunite is rendered complex and difficult by the accompanying impurities. None of the new methods proposed for recovering both  $K_2O$  and  $Al_2O_3$ , has a record of production; however, enough has been done under one of them to indicate that it is of com. value. In this process some base is mixed with the crude alunite and the mixt. heated. When the resultant salts are thus formed, the  $Al_2O_3$  and silicates and  $SiO_2$  in the mass can be sepd. from all sol. sulfates by lixiviation, and the  $K_2O$  recovered from the soln. The  $Al_2O_3$  can then be sepd. by any one of several methods. The special features are: recovery of nearly all of the  $K_2O$ , recovery of 90% or more of the  $Al_2O_3$ , and the high grade of the  $Al_2O_3$  produced (99.5%  $Al(OH)_3$ ). F. W. SMITHER.

**Production and uses of salt peter.** H. S. GALE. *Eng. Mining J.* 107, 385-8(1919).—An account of the history, uses, and sources of  $KNO_3$ , with notes as to its availability for more extensive application as a fertilizer. Reference is made to the important method recently adopted in Chile for isolating a comparatively high grade  $KNO_3$  from the mother liquor which circulates in the Chilean nitrate plants. F. W. SMITHER.

**Extracting helium from natural gas.** G. A. BURRELL. *Oil & Gas J.* 38, 50, 55(1919).—An historical review of the discovery of helium. The properties are shown as particularly adapted to balloon use. He was first noted in Kansas natural gas in 1907, from a trace to 1.84%. It was found in considerable amt. in gas from the Petrolia Field, Texas, in 1917. Three plants were erected there by the Government; all use some form of liquefaction. All constituents except He are liquefied and removed

from the gas. Natural gas should contain at least 0.5% of He; better results can be obtained if the amt. is larger.

R. R. MATTHEWS.

**Method of handling phosphorus.** BERTRAM BLOUNT. *Analyst* 43, 291-2 (1918). —In handling P in cases in which water cannot suitably be utilized, "N in liberal quantities and free from O can be used with safety." CO<sub>2</sub> is not satisfactory for this purpose.

E. J. C.

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Lubrication (HARDY) 2.

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DUCHEMIN: *L'Industrie chimique et les droits de douane. Rapport au Syndicat général des produits chimiques.* 61 Rue de l'Arcade. Paris: 400 pp. For review see *Ann. chim. anal. chim. appl.* 1, 71 (1919).

**Insuring the To-morrow of the American Chemical Industry.** New York: The Literary Digest. 39 pp. For review see *Can. Chem. J.* 3, 104 (1919).

**The J. E. Aldred Lectures on Engineering Practice, 1917-18.** The following subjects are covered: Steam-Electric Power Plant Design. The Relation between Civil and Military Engineering; The Development of Concrete Road Construction; Copper Refining; The Coal Problem; the Growth of Electric Systems; the Control of Stream Pollution; the Manufacture of Structural Steel. Baltimore: The Johns Hopkins Press. 236 pp. \$1.00. For review see *J. Frank Inst.* 187, 375 (1919).

MOLINARI, ETTORE: *Trattato di chimica generale ed applicata all'industria.* Vol. I. *Chimica inorganica.* Part second. 4th Ed. Revized and enlarged. Milano: Ulrico Hoepli. 630 pp. L. 26. For review see *Boll. chim. farm.* 58, 17 (1919).

WIESNER, J. VON: *Die Rohstoffe des Pflanzenreiches.* 3rd Ed., revized and enlarged. Vol. II. Leipsic: W. Engelmann. 864 pp. For review see *Expt. Sta. Record* 39, 430 (1918); cf. *C. A.* 8, 3620.

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**Sulfuric acid.** H. M. WEBER. U. S. 1,291,306, Jan. 14. In making H<sub>2</sub>SO<sub>4</sub> of 98% strength, SO<sub>2</sub> is passed into H<sub>2</sub>SO<sub>4</sub> of 100% strength until at least 5% of additional SO<sub>2</sub> has been taken up, and this acid is then dild. to the desired strength.

**Nitric acid.** C. TONIOLO. Brit. 121,635, Dec. 27, 1917. In the manuf. of HNO<sub>3</sub> by absorbing N oxides in H<sub>2</sub>O in a series of towers in counter-current, strong cooling of the acid passing from tower to tower is effected by artificial refrigeration so that the acid entering each tower may be in the neighborhood of its f. p.; e. g., the acid entering the last tower may be at 4-5°, that entering a preceding tower receiving 13% acid, -8°, and in an earlier tower receiving 65% acid -25°.

**Ammonia, cleansing compositions.** G. WOLFF. Brit. 121,576, Mar. 21, 1918. Org. waste products such as seed cakes, horse flesh and residues thereof, fruit pips, glue residues, and nitrated vegetable products are treated with alk. solns. to recover NH<sub>3</sub> and to obtain a product having detergent properties.

**Ammonium perchlorate; sodium bicarbonate.** D. AANENSEN. Brit. 121,727, Oct. 30, 1918. NH<sub>4</sub>ClO<sub>4</sub> is produced by reacting upon NH<sub>4</sub>NO<sub>3</sub> with NaClO<sub>4</sub> in the presence of H<sub>2</sub>O; the pptd. NH<sub>4</sub>ClO<sub>4</sub> is sepd., and the soln. of NaNO<sub>3</sub> is treated with NH<sub>4</sub>HCO<sub>3</sub> or NH<sub>3</sub> and CO<sub>2</sub> to cause the pptn. of NaHCO<sub>3</sub>; the soln. of NH<sub>4</sub>NO<sub>3</sub> after the removal of the bicarbonate is then used for reaction with a further quantity of NaClO<sub>4</sub>.

**Chromium and iron salts; dyeing; tanning.** T. J. I. CRAIG and P. SPENCE & SONS. Brit. 121,617, Oct. 26, 1917. Mixed solns. of chromic and ferric salts, for use in dyeing, tanning, etc., are prepd. by treating solns. of chromic acid compds. with Fe or reducing compds. of Fe; the acidity of the soln. may be adjusted to give acid, neutral,

or basic products. According to the reducing power of the Fe compd. or Fe used, the mol. ratio of Cr to Fe in the products is greater than, equal to, or less than unity. Examples of the reduction of  $\text{Na}_2\text{Cr}_2\text{O}_7$  soln. by Fe pyrites, metallic Fe, and  $\text{FeCl}_2$ , all in the presence of HCl, are given; FeS and  $\text{FeSO}_4$  also are specified as reducing agents. Cf. 4,890, 1896, 14,052, 1897, 5,902, 1903, and 16,887, 1907.

**Magnesium carbonitride.** E. W. HASLUP. U. S. 1,291,498, Jan. 14. A Mg carbonitride is produced in a blast furnace by charging the furnace with a mixt. consisting essentially of MgO and C (the C being in sufficient excess to insure the maintenance of a reducing atm. in the furnace at all times), heating the charge to a temp. at which carbonitride is formed (preferably about  $1600^\circ$ ) and withdrawing the product from the reaction zone as fast as it is formed.

**Waterproof adhesive.** S. BUTTERMAN. U. S. 1,281,396, Jan. 14. An adhesive suitable for use for some time after prepn. is formed of casein 1,  $\text{H}_2\text{O}$  2.90, hydrocarbon oil 0.015,  $\text{Ca}(\text{OH})_2$  0.15, and Na silicate 0.70 parts.

**Plastic compositions.** C. F. CURTIS. Brit. 121,855, Feb. 19, 1918. The dust left after burning Fe, Cu, or arsenical pyrites is used as an ingredient in a mixt. for an acid-proof compn. The mixt. is: sawdust 30%, portland cement 30%, pyrites residue 30%, whiting 10%. The mixt. is moistened and is applied as a lining or shaped by molding.

**Cleansing and abrading compositions.** NORTON CO. Brit. 121,721, July 11, 1918. To an abrasive composed of cryst. alumina contg. up to 8% of an acid oxide, such as  $\text{SiO}_2$  or  $\text{TiO}_2$ , is added alkali, such as soda, in sufficient quantity to neutralize the acid wholly or in part. The resulting compn. is stated to be less tough and more suitable as an abrasive.

**Dentifrices; polishing powders.** L. V. SLAUGHT. Brit. 121,592, Nov. 12, 1918. A cleansing and polishing powder which may be used in dentifrices, metal polishes, etc., and which consists of amorphous, structureless cellulose or cellulose hydrate, is prepd. by treating viscose soln., preferably freshly prepd., with a salt soln. such as  $\text{CaCl}_2$  or  $\text{NaHSO}_3$  soln., or a mixt. The gelatinous ppt. is washed preferably with  $\text{H}_2\text{O}$  rendered alk. with  $\text{NaHCO}_3$  or other salt and is dried and ground. Some unaltered cellulose fibers may remain in the powder or may be added. An antiseptic, germicide, or medicament such as phenol, cresol, or xyleneol, which may be emulsified with soap, gelatin, gum or sol. oil, or a soln. of HCHO in essential oil, or of Cl in paraffin oil or an essential oil such as oil of lavender, bergamot, etc., may be incorporated in the powder, by spraying the liquid into a moving stream of the powder.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**Observations on apparent causes of failure in lead glass pots.** A. F. GORTON. *J. Am. Ceram. Soc.* 1, 648-59 (1918).—Cracking and corrosion are the chief causes of failure. Cracks are due to strains set up by (1) too rapid heating in the arch, (2) insufficient preheating, (3) throwing in the glass batch. Corrosion is due to slagging caused by Fe impurity and to soln. in the fusing alkali and molten glass. Inability properly to burn the pot bottom during arching causes rapid corrosion. The glaze due to a surface coating of glass or to heating the surface with an oil burner affords but little protection. Lining with a porcelain or high-Al material is likely to fail because of cracking away of the lining. A safer method is to burn the pot thoroughly to  $2500^\circ$  F. Adding porcelain as grog is of little use; it increases tendency to bulge. Some material better than fire clay is needed.

C. H. KERR.

**The identification of "stones" in glass.** N. L. BOWEN. *J. Am. Ceram. Soc.* 1, 594-605(1918).—Stones may be (1) pot stones, (2) batch stones, (3) crown drops, (4) devitrification stones. Chem. analysis for purposes of identification is usually made difficult by the small size of the stones and the contamination of the surrounding glass and analysis is apt to be unsatisfactory. The petrographic microscope is preferable. Powdered samples are quite satisfactory. *Pot stones* are seen to be "in all cases crystals of sillimanite with a little interstitial glass." Sillimanite is never found in stones of other origin. Evidently the glass in acting on the pot material first dissolves in excess  $\text{SiO}_2$  above that required to form  $\text{Al}_2\text{SiO}_5$ . *Batch stones* are unassimilated sand. The  $\text{SiO}_2$  is found in several forms. Frequently the core is unaltered quartz surrounded by a layer of cristobalite or a mixt. of cristobalite and tridymite. *Crown drops* are of  $\text{SiO}_2$  but are distinguished from batch stones by almost complete conversion to tridymite (and usually large crystals compared with the fine-grained cristobalite of batch stones). *Devitrification stones* appear in various forms. Spheruloidal cryst. masses are common forms.  $\text{SiO}_2$ , the most common glass constituent, is perhaps the commonest in sepg. out, usually in tridymite form with some cristobalite. The spherulite appears solidly cryst. but the interstitial glass between the radiating cryst. fibers greatly predominates. "A spherulite grows entirely at the expense of the glass contained within it" and the glass outside the spherulite is unaffected.  $\text{CaSiO}_3$  seps. out as wollastonite. Other crystals that sep. out are  $\text{BaSi}_2\text{O}_7$  and  $\text{PbSiO}_3$ . The optical properties of these crystals are briefly given.

C. H. KERR.

**Some aspects of the scientific glassware industry.** F. W. BRANSON. *J. Soc. Chem. Ind.* 37, 337-407(1918); cf. *C. A.* 9, 2134.—Numerous analyses and tests show that 7.5-8.5%  $\text{ZnO}$ , about 6.5%  $\text{Al}_2\text{O}_3$  and about 7%  $\text{B}_2\text{O}_3$  will give a good glass for this use if the  $\text{SiO}_2$  and alkali are properly proportioned. Regarding  $\text{CaO}$  it is found that if  $\text{ZnO}$  is reduced  $\text{CaO}$  is the best substitute. A glass with 6%  $\text{Al}_2\text{O}_3$  gives increased strength and attacks the pot less. Lab. glassware should be standardized as to sizes and shapes and a committee to accomplish this is urged. Reannealing at  $580^\circ$  after a first annealing at  $580^\circ$  gave a better annealed and more resistant product. This should be studied further.

C. H. KERR.

**Crushing strength of magnesia-silica mixtures at high temperature.** O. L. KOWALKE and O. A. HOUGEN. *Trans. Am. Electrochem. Soc.* 33, preprint.—Magnesia and silica of high purity were mixed in varying proportions, baked at various temps. and cylinders of the mixts. were subjected to pressure in an elec. furnace. The pressure was applied by a C rod at carefully measured temps. When subjected to a definite applied pressure, the temp. at which they crushed was noted. A mixt. containing 7.5%  $\text{SiO}_2$  failed at about  $1870^\circ$ , which was  $190^\circ$  higher than magnesia supported. The superiority of this mixt. appeared to be due to the envelope of forsterite which cemented the grains of periclase and failure is due to a softening of the forsterite. Above  $2000^\circ \text{C}$ . attacked magnesia-silica mixts. very rapidly. The elec. furnace and the arrangement of the cylinder for test are illustrated and photomicrographs support the theory of the formation of compds. between  $\text{MgO}$  and  $\text{SiO}_2$  at the various temps.

W. H. BOYNTON.

**Magnesites and magnesite bricks.** W. DONALD. *Trans. Eng. Ceram. Soc.* 17, 486-561(1918).—See *C. A.* 12, 2675.

C. H. KERR.

**Influence of temperature upon the action of slag upon refractory materials (Howe)** 9. **Basic refractories for the open-hearth (McDowell, Howe)** 9. **Production of clay products, etc., in Canada in 1917<sub>2</sub> (ANON.)** 20. **Native supplies of refractory materials available in the Sheffield district (FEARNSIDES)** 8.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The solubility of portland cement and its relation to theories of hydration. J. C. WITT AND F. D. REYES. *Philippine J. Sci.* 13A, 147-61(1918).—When cement is shaken in  $H_2O$  in a closed vessel large amts. of Ca go into soln. When 8000 parts of  $H_2O$  are used, 90% of the Ca present goes into soln. within 24 hrs. The results show close relation to accepted theories of hydration. Soly. of Ca is affected by the presence of  $CO_2$ , method of agitation, fineness of grain, vol. of  $H_2O$ , and time. It was not found possible to obtain a satd. soln. of  $Ca(OH)_2$  by shaking cement with  $H_2O$ . Contrary to the accepted theory, the authors claim their expts. indicate that excess of gaging  $H_2O$  produces greater hydration and greater strength. By adding excess  $H_2O$ , then evapg. to the amt. indicated by normal consistency tests, and molding, briquets increased in strength as the amt. of  $H_2O$  increased.

C. N. WILEY.

Tentative specifications for C 14-18T-cement-concrete sewer pipe. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 555-66(1918).—Directions are given for crushing, hydrostatic pressure and absorption tests.

H. A. BRIGHT.

Silica cement. R. J. MONTGOMERY. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 350-62(1918).—General discussion of the methods of testing and compn. of silica cement. These cements consist of ground ganister rock, with varying amts. of clay. The following tests are suggested as giving complete information regarding a silica cement: (1) analysis, (2) fusion cone, (3) sieve test using 20-, 48-, 100- and 200-mesh. Tyler standard sieves, (4) drying shrinkage, (5) burning tests at several cones as nos. 1, 8, 13, and 20 to det. (a) burning shrinkage, (b) total shrinkage, (c) porosity, and (d) apparent sp. gr.

H. A. BRIGHT.

The production of cement, lime, clay products, stone and other structural materials in Canada during the calendar year 1917. Can. Dept. Mines, Mines Branch, *Adv. Chapter of Annual Rept. on the Mineral Production of Canada during 1917*, No. 500, 44 pp.(1919).

E. J. C.

Compressing concrete increases its strength. F. P. MCKIBLEN. *Eng. News-Record* 81, 1031-4(1918).—Results are shown for comparison of compressive tests on concrete columns of 1:2:4 concrete and "compressed concrete" columns made similarly of 1:2:4 concrete but compressed during the process of molding with loads varying from 25,000 to 40,000 lbs. All columns were approx. 5 ft. long and 14 in. wide. The compressed concrete averaged 153 lbs. per cu. ft., about 4% higher than the ordinary concrete. Each compressed column was molded in 5 layers, about 12 in. deep, the pressure being allowed to remain on each successive layer for a few min., the plunger being then withdrawn and the next layer spaded in the form and compressed. For 28-day ordinary columns the av. compressive strength is 1774 lb. per sq. in., for compressed column with a load of 25,000 lbs. 2255 lbs. per sq. in., for 30,000 lbs., 2,540 lbs. per sq. in., and for 35,000 lbs. 2,780 lbs. per sq. in.

H. A. BRIGHT.

Tentative tests for the determination of apparent specific gravity of sand, stone and slag screenings, and other fine non-bituminous highway materials. ANON. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 689-93(1918).—Both the Le Chatelier and Jackson tests are equally suited for these detns.

H. A. BRIGHT.

Sand and gravel in 1917. R. W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part II, 381-96 (preprint No. 25, published Feb. 21, 1919); cf. C. A. 12, 525.

E. H.

Report of Committee D-4 on road materials. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 326-33(1918).

H. A. BRIGHT.

Sampling of deposits of road stone and gravel in the field. L. REINECKE AND K. A. CLARK. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 393-415(1918).—Methods are outlined for sampling and testing bed-rock and boulder aggregates or gravel suitable for use in road work. H. A. BRIGHT.

Abrasion test for stone gravel and similar aggregates. H. H. SCOFIELD. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 416-28(1918).—In the standard Deval test for road materials the retention of dust tends to misleading results. A new machine designed to eliminate this objection has given better results. H. A. BRIGHT.

Report of committee C-4 on clay and cement sewer pipe. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 274-80(1918). H. A. BRIGHT.

Tentative definitions of terms relating to the gypsum industry. *Proc. Am. Soc. Testing Materials* 18, Pt. I, 592-611(1918). H. A. BRIGHT.

Effects of grading of sands and consistency of mix upon the strength of plain and reinforced concrete. L. N. EDWARDS. *Proc. Am. Soc. Testing Materials* 18, Pt. II, 303-16.—A supplementary paper (cf. C. A. 11, 3409). The one-yr. tests supply these further conclusions: (1) the increment of strength developed between the age of 90 days and one year is not const. and cannot be predetd., and in wet concrete this increment is almost negligible; (2) the results obtained in the consistency-abrasion test indicate that the excess water in an over-satd. concrete reduces its resistance to abrasion and shock. H. A. BRIGHT.

Effect of age on concrete. D. A. ABRAMS. *Proc. Am. Soc. Testing Materials* 18 Pt. II, 317-35(1918).—A study of a large no. of test data on the strength of briquets and mortars was made to investigate the laws governing the change in strength of concrete. Age-strength relations for tension tests of 1 to 3 standard sand mortars indicate that slight retrogression in strength occurs after ages of 3 to 6 mos. There is, however, a different age-strength relation found for concrete when tested in compression. Plotting results with compressive strength as ordinates and age of tests (logarithmic scale) as abscissas the path of the lines is expressed by the equation  $S = n \log a + K$ , where  $S$  = compressive strength,  $a$  = age of test, and  $n$  and  $K$  are consts. whose values depend on the quality and other conditions of the test. The diagrams show that the strength of concrete seems to increase indefinitely so long as it does not dry out. If the concrete becomes wet only due to exposure to the weather, the change in strength is much slower than if the concrete is continuously satd. with water. H. A. B.

DWARS, A. W. C.: Beton en gewapend beton. Beknopte handleiding bij middelbaar technisch onderwijs, tevens ten dienste van kandidaten voor het diploma bouw-kundig opzichter en technisch ambtenaar. R. W. Utrecht: A. E. Kluwer te Deventer. 71 pp. f 1.60. For review see *Chem. Weekblad* 16, 128(1919).

Cements. B. BAARNHIELM. *Brit.* 121,728, Oct. 30, 1918. Ground ashes of burnt alum-slate are mixed with portland cement. The proportion may be of equal parts or the ashes may be in greater proportion.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

The production of coal and coke in Canada during the calendar year 1917. JOHN MCLEISH. Can. Dept. Mines, Mines Branch, *Adv. Chapter of the Annual Rept. on the Mineral Production of Canada during 1917*, No. 501, 39 pp.(1919); cf. C. A. 12, 1345. E. J. C.



**Oxidation of coal.** J. R. PARTINGTON. *Chem. News* 118, 50-1(1919).—P. criticizes the deductions drawn by Wheeler (cf. *C. A.* 13, 651) and suggests another hypothesis to explain W.'s results. From a mixt. of gases in contact with freshly hewn coal deprived of its occluded gas, adsorption takes place on the surface of the coal. Owing to preferential adsorption of moisture, permanent gas adsorption with dry air should be greater than with moist air. The adsorbed layer of gas reacts with the coal to produce CO and CO<sub>2</sub>. The pressure of the air brought in contact with the coal falls rapidly for a short period and then gradually until adsorption equil. is reached. The primary product of the reaction which then begins is CO alone. CO<sub>2</sub> is produced by a secondary reaction involving moisture. CO<sub>2</sub> is produced either by the interaction of CO with water, the latter acting as a catalyst, or by the direct interaction of adsorbed moisture with C. The H produced may be wholly reoxidized, retained on the adsorbent, or traces may escape. P. takes up the different points brought forward by W. and shows how the adsorption hypothesis explains results more fully, and without the assumption of any hypothetical chem. compd. A. G. BLAKELEY.

**"Sandwich" system of fuel blending.** E. W. L. NICOL. *Gas J.* 145, 113(1919); *Gas World* 70, 58-9(1919).—The "Sandwich" system of fuel blending, as devised by N. and practiced by several fuel users, consists in feeding 2 solid fuels, such as bituminous coal and coke, on to a mechanical stoker from a double hopper so that the fuel enters the furnace in well-defined superposed layers, the coal being on top. The volatile gases given off from the latter maintain the fire-brick ignition or coking arch in an incandescent state, thus establishing positive and continuous ignition at the point of entry on the grate. With a simple and intimate mixt. of coal and coke in any considerable proportion, it has been found impossible to maintain these essential conditions as the arch gradually cools and misfiring occurs. By this system of blending, solid fuels having different physical and chem. properties can be blended so as to improve the efficiency and intensity of combustion to a considerable extent. Some successful experiences suggest the possibility of utilizing as a primer for coke the various low-grade and waste fuels which are ordinarily hard to utilize in any way. Some actual working results obtained by using coal slack and unscreened broken coke as compared with coal alone under exactly similar conditions on the same B. & W. boiler and economizer are, resp.: calorific value as fired, 11138-12150 B. t. u.; fuel consumed per grate ft. hr., 30.66-31.66 lbs.; av. steam pressure, 178-179 lbs.; water evapd. per lb. of fuel, 7.18-5.76 lbs.; efficiency, 79.96-60.98%. J. L. WILEY.

**Motor fuel.** G. K. GJERDE. *Papier Journalen* 1918, No. 6, 42.—Comparison between the advantages and disadvantages of various kinds of motor fuel, acetylene gas, gasoline, sulfite alc., etc. It is shown that sulfite alc. is the best substitute for gasoline. To facilitate the starting up of the motor about 20% C<sub>6</sub>H<sub>6</sub> or other suitable hydrocarbon should be added to the alc. Even coal oil can be added advantageously, notwithstanding the fact that coal oil and alc. do not commingle completely.

G. HALLBERG.

**Institution of gas investigation committee.** JAMES W. WOOD. *Gas J.* 145, 167-9 (1919).—Reply to criticisms (cf. *C. A.* 13, 507). J. L. W.

**Natural gas: its production, service and conservation.** SAMUEL S. WYER. U. S. National Museum, *Bull.* 102, Pt. 7, 66 pp.(1918).—The fundamental principles of natural gas production, transmission and distribution are discussed. Special emphasis is placed on the wasteful methods employed in connection with the utilization of natural gas, and a plea is made for greater public interest in the enforcement of methods for conserving it. J. L. WILEY.

**The future of gas producers and their utilization of fuel.** G. MARCONNET. *Chimie*

& industrie 2, 6-14(1919).—A plea for more intensive and economical utilization of inferior fuel resources by gasifying in gas producers with recovery of by-products.

J. L. WILEY.

Discussion, from the chemical viewpoint, of E. Körting's lecture on the economic status of the gas industry. H. BUNTE. *J. Gasbeleucht.*, Aug. 24, 1918; *Hel Gas* 38, 283-7, 297-301.—Various phases of the gas industry are discussed, with particular emphasis on the question of coal supply. Lignite in Germany, and peat and wood in surrounding neutral countries, were much used in gas plants during the war; but in normal times no fuel can compete with good gas coal for this purpose. Increasing the yield of gas, by dilg. with water gas to a heat value of 4700 calories is not advisable either from the producers' or the consumers' standpoint. There is much need of further study of methods of increasing the gas yield. JULIAN F. SMITH.

Operation and chemical control of water gas sets in small plants. H. VITTINGHOFF. *Am. Gas Eng. J.* 110, 163-4(1919); *Gas Record* 15, 109-12(1919).—Some essential points to observe in operating small plants are discussed. Regularity of operation is necessary for economical operation; the set should be cleaned once every 12 hrs. at least, and preferably once every 8 hrs.; the interval between the charging of the generator should not exceed an hour or embrace a max. of more than 8 runs; the blow and run should be started and the oil introduced strictly on a carefully worked out schedule. The use of pyrometers is essential to regulate the temp. of the carburetor and superheater, the proper temp. of course depending on the individual machine, the location of the sensitive ends of the thermocouple and upon the quality of oil to be carbonized. Usually a temp. between 1340 and 1380° at the bottom of the superheater and about 1340° at the top results satisfactorily. Two methods for controlling the temp. are: varying the vol. of blast, or varying the period of the blast while the vol. is kept const. Usually, the latter method is followed, the length of the blow being increased or decreased, depending upon the conditions, care being taken, however, not to decrease the period below a certain point nor during a number of consecutive cycles as this results in a low temp. of the fuel in the generator and an increased production of CO<sub>2</sub>. In injecting oil into the carburetor, it often happens that the excessive heat of the upper layers of the checker brick breaks down the oil into C and H. This can be prevented by introducing steam into the generator so that the blue gas formed may absorb some of this heat before the oil is introduced. It is also important to consider the amt. of air, steam and oil used. Experience has shown that 1500-1700 cu. ft. of generator air per thousand cu. ft. of gas will result in a hot fire, proper temp. in carburetor and superheater for distn. and carbonization of the oil, and an economical fuel consumption. It has also been found that 35-38 lbs. of steam per thousand cu. ft. of gas will yield a blue water gas free from an excessive amt. of harmful CO<sub>2</sub> and at the same time load the set up to its most economical rate of production. In order to operate a plant efficiently expert supervision and chemical control are necessary. The raw materials should be carefully analyzed for quality and the operation varied accordingly, and frequent systematic observations should be taken of the finished gas as well as the intermediary blue water gas, producer gas and waste gas. The CO<sub>2</sub> should be reduced to a minimum, not in excess of 4%. But even if the finished gas does contain CO<sub>2</sub> not in excess of this amt., it does not necessarily indicate that the operation is being carried on economically, for often the blue water gas as produced in the generator contains an excessive amt. of CO<sub>2</sub> which on contact with the oil injected in the carburetor is reduced but at the expense of economy. The excess of CO<sub>2</sub> may be due to either too much steam relative to the heat available in the fuel bed, or improper rate of steam introduction. Having given a fixed wt. of incandescent fuel, the quality of blue gas depends upon the amt. of steam introduced per min. and upon the temp.

of the body of fuel at various instances during the run. Having detd. the total amt. of steam which can be introduced per run, it can be assumed that in a 4-min. run, 65% should be introduced the first 2 mins, 20% in the third and 15% in the last. Good practice seems to indicate that the blue water gas as made at first should contain about 3% CO<sub>2</sub>, which may increase to 4.5% during the middle period and not to exceed 7% during the last minute. An excess of steam injected is not only an expensive waste of boiler fuel but also results in poor generator fuel economy and oil results. A large amt. of steam will not necessarily result in a large make of gas per hr. nor will a small amt. give good results since the capacity of the set is reduced, thus requiring larger labor expense, and serious clinker troubles may result, requiring added cleaning and heavy wear on the linings of the machine. In obtaining a proper balance between CO<sub>2</sub> and CO in the producer gas, the rate and amt. of air flow through the generator must be regulated. A relatively high rate of flow tends toward a production of large amts. of CO<sub>2</sub>; therefore it is desirable to introduce the air during as short a blow as feasible in order to obtain as high a rate of flow as possible. Samples should contain about 14% CO<sub>2</sub>. During the run CO<sub>2</sub> increases on account of the decreasing temp. of the fuel bed; the opposite is true during the blow, CO being formed in increasing quantities, as the temp. increases. This fact must be considered in handling the carburetor blast valve so that the secondary air introduced into the carburetor should be in proportion to the amt. of CO available, increasing from a minimum at first to a max. at the end. It is better to have an excess of secondary air than a deficiency permitting unconsumed amts. of CO to escape at the stack. In regard to chemical control of the waste gases, analysis of a composite sample taken during 5 or 6 consecutive blows should show CO<sub>2</sub> 18-19%, O<sub>2</sub> 0.5-1%, CO 0.3-0.4%. An excess of O would mean too much carburetor blast, while an excess of CO would indicate the reverse. J. L. WILBY.

**Village gas works—new gas-making process.** C. B. TULLY. *Gas J.* 145, 215-6 (1919); *Gas World* 70, 71(1919).—In order definitely to prove the possibilities of a low-grade gas of 350-400 B. t. u. for distribution on practical lines, a small plant was installed at Kingscliff to produce such a gas from non-caking hard coal by completely gasifying the fuel and producing the max. quality of gas from a minimum of coal, at the same time avoiding the necessity of marketing residuals. Coal, coke, a mixt. of the two, or a mixt. of coke and peat, can be satisfactorily used. The gas has satisfied all requirements both for domestic and industrial uses with more economy and simplicity than ordinary coal gas. Only slight adjustments on burners and fittings were required. The plant consists of a small generator, wash box, vertical steam boiler and engine and blower. The gas from the wash box passes direct to the existing plant through the foul main, condensers, scrubber, oxide purifiers and meter into the gas holder. The plant makes 2000 cu. ft. per hr., and produces 40,000 cu. ft. of 400 B. t. u. gas per ton of coal. The only labor required is that of a boy of 16 yrs. who has charge of the whole plant, which operates only 4-5 hrs. per day. J. L. WILBY.

**Vertical retort steaming tests at Springfield.** L. J. WILLIEN. *Gas Age* 43, 232-3 (1919); *Am. Gas Eng. J.* 110, 211-3(1919).—The process of steaming, as practiced since 1906 by the Springfield, Mass., Gas Light Co. in Dessau vertical retorts, consists in introducing steam at the bottom of the retorts during the last 2 hrs. of the carbonizing period. By using steam in this way the yield of gas is increased about 20%, the candle power is reduced 25%, and the B. t. u. 8%. The temp. of the incandescent C has a direct bearing on the amt. of blue water gas formed. At 1240° F. 8.8% of the steam was decomposed, yielding a gas consisting of 65.2% H, 4.9% CO and 29.8% CO<sub>2</sub>, whereas at 1960° F. 99.4% of the steam was decomposed with a gas showing 50.9% H, 48.5% CO and 0.6% CO<sub>2</sub>. In 1917, tests were made on 1 unit of the Glover-West continuous vertical retorts, consisting of 24 retorts, operating 1 week with steam

and 1 without steam, the steam being admitted continuously. Steam connections were made at the top of the casting connected to the bottom of the retort by a  $\frac{1}{4}$  in. line. In order to obtain an equal distribution of steam into each retort, a valve and a disk with a  $\frac{1}{4}$  in. orifice were installed at the inlet. The amt. of steam used was measured by placing a disk with a  $\frac{1}{2}$  in. orifice in the main steam supply line and pressure gages on both sides of the disk, the steam pressure being kept const. by means of a pressure regulator on the high pressure side. Steam superheated to about  $200^{\circ}$  F. was used to the amt. of 8400 lbs. per day or 350 lbs. per retort. The pressure was regulated to 20 lbs. Operating results with and without steaming, resp., show a yield per cu. ft. of 6.72 and 5.49, or 22.4% gain; B. t. u. per cu. ft. 519 and 540, or 3.8% loss; c. p. 7 and 9.5, or 26.3% loss. The av. no. of retorts out per day for scurfing was 43.7% less with the steam than without. The formation of C on the sides of the retort was reduced between 40 to 50%, that formed being of an amorphous nature and easily removed. The gas analyses indicate an improved quality of gas. The % compn. with and without steaming, resp., was as follows:  $\text{CO}_2$  1.69-1.23,  $\text{C}_2\text{H}_4$  1.65-1.07,  $\text{C}_2\text{H}_2$  0.95-0.97,  $\text{O}_2$  0-0,  $\text{CO}$  11.16-7.92,  $\text{CH}_4$  24.67-27.33,  $\text{H}_2$  56.18-57.69,  $\text{N}_2$  3.7-3.8. The production of  $\text{NH}_3$  was increased about 12%. The coal used showed about 35% volatile, 8% ash and 1.5% S. There was practically no loss in coke. W. concludes that steam may be used to advantage with through horizontals or inclined retorts, with probably a smaller yield, however.

J. L. WILEY.

**Discrepancies between observed and calculated values of combustible gases.** NORTON H. HUMPHRYS. *Gas World* 69, 314(1918).—The differences noticed in comparing the observed and calcd. values of combustible gases are of no real importance and usually may be attributed to variations in accuracy of app. employed and in the arbitrary values given for hydrocarbons other than  $\text{CH}_4$ , which may be fairly const. with some systems of manuf. but vary widely with others. With straight coal gas of av. quality, produced by hand stoking and horizontal retorts, the difference is usually about 20-25 B. t. u., but it is more erratic with verticals, especially with steaming. Blue gas made from gas coke by the cupola process is about the same as coal gas but the difference rises with the degree of carburization to 50 B. t. u. or more in favor of the observed test. With rich oil gas the difference is greater. It is evident that anything like a complete agreement between observed and calcd. calorific values can be only a matter of luck.

J. L. WILEY.

**Composition of luminous gases as affecting air complement.** NORTON H. HUMPHRYS. *Gas World* 69, 346(1919).—H. attempts to establish values for the compn. of hydrocarbons other than  $\text{CH}_4$  in gas which contributes to the production of heat. He recommends that there be prepd. a standard table of calorific values for each of the constituents concerned, the conditions of pressure, temp., satd. or dry, etc., being clearly defined. (Cf. following abstract.)

J. L. WILEY.

**Composition of illuminating gases as affecting air complement.** G. NEVILL HUNTLEY. *Gas World* 70, 34(1919).—A criticism (cf. preceding abstract). J. L. W.

**Valuation and methods of analysis of spent oxide.** HAROLD G. COLMAN AND E. W. YEOMAN. *Gas J.* 145, 68-9, 112-3, 169-70(1919).—A review of some analytical methods of estg. free S, CN compds. and total  $\text{NH}_3$ .

J. L. WILEY.

**Operating a water gas set without a relief holder in parallel with by-product coke ovens.** A. H. HARRIS, JR. *Am. Gas Eng. J.* 110, 185-8(1919).—Owing to the difficulty of maintaining a city gas supply with sole reliance upon by-product ovens at the plant of the Coal Products Manuf. Co., Joliet, Ill., it became necessary to instal an auxiliary water gas set of the latest standard design of the United Gas Improvement Co., with a capacity of 3.5 million cu. ft. Some trouble was experienced at first in operating due to the inability of the purifiers to handle the increased amt. of gas without

high back pressure, but after some manipulation of the exhausters and some minor changes in the cooler and saturator, a normal operation was obtained. Accurate results are not to be expected, but av. operating economies are suggested. J. L. W.

**Valuation of crude benzenes and a useful separating device.** KENNETH NORTON. *Gas World* 69, 331(1918).—An app. to be used in place of a sepg. funnel in examg. benzene and naphtha is described. It consists of a Winchester qt. bottle fitted with a 3-hole rubber stopper through which passes (1) a narrow vent tube drawn out to a jet at one end, and long enough to reach to the bottom of the bottle, the other end being bent at right angles and temporarily closed with a piece of rubber tubing and glass rod; (2) a short piece of glass tubing passing only half way through the stopper and serving as an outlet, it being ground off obliquely at its lower end in order that it may drain quickly; (3) a glass rod tapered at the end and bent in hook shape and capable of sliding up and down in the stopper so that its tapered end may enter and close the hole above the outlet tube when required, thus acting as a stopper. In performing a test, the benzene or naphtha is well mixed with the caustic or acid, the glass stopper replaced by the rubber app., and the bottle inverted and placed on a tripod for the contents to sep. When the contents have sufficiently sepd., the plug is removed from the bent tube, the valve rod is lifted and the lower layer of liquid allowed to run out. A clean sepn. is readily obtained without any waste. Quick and accurate manipulation is insured. J. L. WILEY.

**Estimation of benzene in gas.** EMILE DE SAINTE-CLAIRE-DEVILLE. *Paris Gas Co. Gas World* 70, 18(1919); *Gas J.* 145, 272-3(1919).—The process consists in freezing out the benzene in the gas with the aid of liquid CO<sub>2</sub>. Some CO<sub>2</sub> snow is inserted into the interior of a Dewar flask, and sufficient acetone is added to make a thick paste. This paste will have a temp. of -81°. Into it is thrust the refrigerating tube, through which the condensate is collected. The gas is passed at the rate of about 50 l. per hr. The temp. in the flask remains below -72° for at least 5 hrs., but usually 3 hrs. are sufficient to obtain enough condensate to give a good measurement by vol. The tube is withdrawn from the flask and allowed to assume the temp. of the laboratory, any excess of gas being allowed to escape, and the vol. of the condensate is read off. Finally the condensate is weighed and the wt. per cu. m. of gas, corrected, is calcd. Besides the frozen benzene, there is also a small amt. of liquid in the tube which gives an indication as to the amt. of toluene in the gas. The general results show that the amt. of benzene produced by the distn. of coal of av. quality is about 1.2% of the wt. of the coal and that 95% of this remains in the gas, 5% only in the tar. J. L. WILEY.

**Method of increasing the efficiency of pot stills for benzene recovery.** J. PARKER. *Gas World* 70, No. 1802 (Coking and By-products Sec.), 12 (1919).—The disadvantages of direct-fired pot stills over steam plants are: (1) failure completely to strip the wash oil of the absorbed benzene even at excessively high working temps.; (2) premature sluggishness of the wash oil owing to local overheating; (3) constant attention required by the operator; (4) danger of fire. B. overcomes the disadvantage of poor stripping by introducing a simple column, packed with earthenware rings, between the pot still and the heat exchangers and running the heated oil therethrough, the benzene being effectively removed by means of live steam, the vapors passing off through the main pipe to the condenser along with the vapors from the pot still. The following results are obtained: (1) the yield of benzene is more than doubled; with the pot still 1 to 1.5 gal. was recovered; (2) the quality is improved from 50-55% at 120° to 65-70° at 120°; (3) due to the lower temp. of distn., 125-130° against 160° and upwards, the wash oil has a longer life. J. L. WILEY.

**Toluene recovery operations in greater New York.** W. J. MCGURTY. *Gas Age* 43, 175-80(1919).—The process used in the plants designed and built for the U. S.

Ordnance Dept. by the Bartlett Hayward Co. is described. Altogether 9 toluene plants were built and operated with a total production for the various periods of time operated of 3,703,826 gals. light oil, 1,525,835 gals. benzene and 975,476 gals. toluene. The total av. purity of the toluene shipments was 82.5% with several of better than 90% while individual plant av. production was over 86%. A description of the operation is of interest on account of its novelty, simplicity and economy. The crude gas prior to entering the purifiers passed through 2 scrubbers filled with wooden grids and in series, designed to allow for a certain gas velocity and time of contact between the wash oil and gas. The ascending gas in No. 1 scrubber was washed with partly benzolized oil which had been used in No. 2 scrubber to secure complete removal of the light oil vapors. The wash oil was pumped through spray nozzles in the top of the app. at a specified rate in gals. per M cu. ft. of gas treated. The oil used was "straw oil." By the use of thermometers in the gas and oil piping it was possible to supply the wash oil at a temp. minimizing the condensation of water vapor from the gas and the efficiency loss due to consequent emulsification of the oil. The outgoing gas passed through a catch scrubber, which not only arrested any entrained oil particles but served also as a mixing chamber for the enriching vapors. The benzolized oil leaving the first scrubber was pumped to a tank under the roof of the still building where foreign matter picked up in circulation was collected. In the app. through which the oil successively flowed, increased temps. were secured through heat absorption from the light oil vapors, then in the oil to oil heat exchanger, thus effecting economies in the steam required to heat the oil. The first steam heater was heated by exhaust steam, the second by high pressure steam in order to provide the necessary oil temp. for the stripping operation. This temp., 115-135°, depended on the time element in the stripping still, requiring increased temps. with increased rates of oil flow. In the cast-iron column still the oil descending from section to section gave up its light oil vapors to an ascending vol. of live steam, which, in passing through the hooded ports, was forced to bubble through the oil, sealing the hoods, the resultant scrubbing action effecting the removal of the desired vapors. The amt. of low pressure steam supplied the latter app. was controlled by a thermostat, which by maintaining a constant temp. in the existing vapors insured further economy in steam. The debenzolized oil leaving the stripping still passed through the oil to oil heat exchanger, then through a tubular fresh water cooler to the decanter, which not only sepd. the water but also collected the sludge and resinous matter in the oil. From the decanter the oil was pumped through refrigerating coils and then returned to the scrubber pump for recirculation. The light oil vapors were conveyed from the stripping still to the bottom of the wash still, the dephlegmating action of which condensed the heavier vapors with the formation of "secondary oil," allowing the lighter or "primary oil" vapors to proceed to the condensers. This method of splitting the vapors made a speedier and more easily controlled fractionation possible. The "primary oil" vapors, after a heat transfer in the first condenser, were cooled with water in the second tubular condenser, passing from there to the decanter. This app., divided into 2 chambers by means of a partition plate, also sepd. the water from the "secondary oil," and each oil overflowed an internal skimmer and passed through condensation meters into their resp. receivers, from which they were removed to storage. The vapors arising from the decanters, distillers, etc., were passed through miniature scrubbers and the condensed oil returned to the decanter. The non-condensable olefin vapors were piped to a small blower for return to the scrubbed gas. These operations formed a continuous cycle, the hourly thermometer readings indicating whether the desired operating conditions were being maintained, and oil meters enabled the operator to check any changes in the rate of oil flow necessary to secure sufficient recovery results from the varying vols. of gas produced during periods of high and low consumption. The final operation, fractions-

tion of recovered oil, was conducted intermittently. Light oil, in charges of 6,500 gals., was pumped into the steel tank-still, provided with a steam-heating element, a superimposed rectifying column and a dephlegmator. The vapors ascending the rectifying column entered each section through a no. of openings, each covered with a cast-iron bell, the perforated edges of which were sealed in oil. The bubbling action produced a result similar to stripping, the lighter vapors passing to the dephlegmator, where selective condensation permitted the desired vapors to proceed to the condenser, while the heavier condensates returned to the column for further treatment. This operation was conducted by means of a recording thermometer on the outlet vapors, the frequent b. p. tests of the condensate being indicative of the progress of distn. as well as to the proper disposition of the products in the storage system. These tests assured also that all the toluene recovered was available for refining and nitrating. The benzene produced was prepared with a dry point of  $85^{\circ}$ .  
J. L. WILEY.

Back-creeping in the burning of gaseous explosive mixtures. ANON. *Gas World* 70, 22-3(1919).—A furnace has been devised which is said to do away with back-creeping of combustion in the gas mixt. discharge nozzle, even with a comparatively low flow velocity. This is accomplished by forming the nozzle of some material of high thermal cond., such as cast iron, and of sufficient cross-section so that all parts shall have the required heat-conducting capacity for carrying away all heat reaching such part. In addition it is set in the furnace wall and protected by suitable refractory cement in such a way that it is shielded from direct access of the furnace heat. For taking from the nozzle the heat conducted from its exposed portions backward through its body and releasing it into the outer air, the nozzle is provided with heat dissipating fins. Such construction has been found entirely satisfactory under various conditions of operation, and makes the provision of special means, such as a circulating fluid, for carrying away the heat from the nozzle wholly unnecessary.

J. L. WILEY.

Acidity of sulfate of ammonia. P. C. GARDINER. *Gas J.* 145, 65(1919).—In order to det. in what way acid is held by  $(\text{NH}_4)_2\text{SO}_4$  samples A, B and C were taken and allowed to drain for periods of time which varied from mins. in the case of A to weeks in the case of C. Analyses showed a % of acid by wt. for A of 1.442, B 0.388, and C 0.165. The reduction in the acidity after long draining indicates that the bulk of it is on the surface of the crystals, and confirmatory washings with equal amts. of neutral water show practically all the acidity to be eliminated by the first washings. Since only the merest trace was found in the 4th and 5th washings, it is concluded that no acidity exists in the interior of the crystal itself.

J. L. WILEY.

Acidity of sulfate of ammonia. JOHN T. SHERARD. *Gas J.* 145, 115(1919).—S. criticizes the work of Gardiner (cf. preceding abstr.) in that such washings of sulfate crystals partially dissolves them and causes loss. S. mentions but does not describe a modification of the ordinary method of sulfate manuf., which he has patented, whereby perfectly neutral salt is obtained at no extra cost. In order to show the behavior of free acid in sulfate when exposed to the air, as regards its effect in preventing the drying of the salt and promoting the absorption of moisture from the air, some sulfate containing 3.5% moisture and 0.5% free acid was exposed to the air for periods ranging from 20 to 260 hrs. At the end of the test there was found 0.27% of moisture, a total loss of 3.23%.

J. L. WILEY.

New Coppée coal washing and coking plant at Port Talbot. ANON. *Gas World* 70, No. 1798 (Coking and By-products Section), 18-20(1919).—The installation consists of: (1) a coal treating plant composed of a coal washery having a capacity of 120 tons of raw coal per hr., together with coal crushing and storage plant; (2) coking plant, consisting of 2 batteries, 120 ovens of the vertical flued regenerative type, capable of

carbonizing per week 5800 tons of washed coal, containing 20-25% volatile matter; (3) by-product plant for recovery of tar,  $\text{NH}_3$ , benzene, and for production of  $(\text{NH}_4)_2\text{SO}_4$  by the "continuous wet process," and rectification of crude benzene for com. 90's, 50's and solvent naphtha. In addition there are provided the necessary boilers arranged for hand-firing, where the slurry from the washers will be burned, a gas holder of 700,000 cu. ft. capacity and a water cooling tower with pumps. J. L. WILEY.

**Centrifugal fans and their application to gas engineering practice.** FRANK S. TOWNEND. *Gas J.* 145, 116-9 (1919); *Gas World* 70, 41-2 (1919).—The paper presents an elementary theory of the fan; a description of the radial flow and the mixed flow type; a discussion of fan efficiency, methods of driving, and their regulation; and a description of concrete examples of the latest practice in the application of fan plants. As a gas engineering device, the centrifugal fan, for large vols. against fairly high heads, is the most compact and efficient of mechanical gas propellers. It is reliable, with a low repair bill. Its high speed enables it to be direct-coupled to the most efficient power units—the steam turbine and the electric motor. Its chief disadvantage is that it will not take overload to the extent that a positive blower will; and its efficiency does not remain at the max. over a very wide range of discharges. J. L. WILEY.

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Testing natural gas for gasoline content (OBERFELL, *et al.*) 22.

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MACHE, H.: *Die Physik der Verbrennungserscheinungen*. Leipzig: Veit & Co. 131 pp. Geh. M. 6, geb. M. 8 und 25%. Teuerungs-aufschlag. For review see *Chem. Weekblad* 16, 26 (1919).

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**Fuel briquets.** C. E. HIRE. U. S. 1,290,992, Jan. 14. Coal is formed into briquets with a binder produced by mixing starch 0.5% with  $\text{H}_2\text{O}$  6%, heating and stirring to form a paste of bursted starch granules and then mixing and emulsifying with 1% of petroleum residuum (the proportions being based on the wt. of coal).

**Recovering nitrogen from fuel in gas manufacture.** A. RIEDEL. Dan. 23456, Sep. 2, 1918. Coal, steam and chlorides react in the fire zone to produce  $\text{NH}_4\text{Cl}$ .

**Extracting ammonia from gases.** E. L. PRASE. Brit. 121,754, June 22, 1917.  $\text{NH}_3$  is extd. from hot gases, *e. g.*, gases passing from furnaces or gas producers, by a soln. of a salt, such as  $\text{CaCl}_2$  or  $\text{ZnCl}_2$ , possessing the property of forming a double compd. with  $\text{NH}_3$ , which is delivered as a shower or spray by one or more distributing devices provided with spraying nozzles into a vessel through which the gases are caused to rise. The construction and operation of a suitable app. are specified.

**Oil gas.** HOLLANDSCHE RESIDUUGAS MAATSCHAPPIJ. Holl. 2,655, Oct. 15, 1918. A pair of generators are used, in which oil gas and water gas are produced alternately. Liquid hydrocarbons are used as the initial materials. The water gas formed in one of the generators is conducted to the other generator in which the oil gas was produced, in order that the residue therein may be reconverted into satd. hydrocarbons by hydrogenation. The operation of each generator is then changed.

**Distilling tar, etc.** J. W. WEXWOOD. Brit. 121,804, Jan. 2, 1918. Tar and like liquids are dehydrated and distd. by passing through a preheating tank, a still heated by high-pressure hot-water tubes, and a final sepg. vessel into which the heated tar is admitted in spray or films by means of a pipe, and which is heated by high-pressure hot-water tubes on part of which the tar is caused to impinge. The hot water circulates through a heater arranged in a furnace, from which the products of combustion pass by a flue to heat the still and a sepg. vessel. In treating tar, the contents of the still are raised to about 230°.



**Coking.** C. W. SIMPSON and L. MOORHOUSE. Brit. 121,854, Feb. 19, 1918. Coal, shale, peat, etc., are carbonized in a retort which is heated electrically so that the temp. may be easily controlled. The current is transmitted through the charge by means of electrodes embedded in the lining of the retort or oven and in direct contact with the charge. Cf. 20,115, 1910, 13,951, 1914.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

**Testing natural gas for gasoline content.** G. G. OBERFELL, S. D. SHINKLE and S. B. MESERVE. *J. Ind. Eng. Chem.* 11, 197-200(1919).—An app. and a method are described for removing gasoline from natural gas by means of charcoal or other adsorbents, with subsequent removal and collection of the gasoline by distn. Both lean and rich gases can be thus examd. The adsorbent, containing the gasoline, is introduced into a flask containing straw oil or glycerol, for distn., the latter being preferable. Both the glycerol and adsorbent can be recovered for use. The results check satisfactorily with those obtained by oil absorption methods. W. F. FARAGHER.

**Present status of refinery practice.** E. W. DEAN. *Oil & Gas J.* 17, No. 38, 52-3(1919).—The output of gasoline may be increased by universal adoption of higher end-point, use of more efficient refining methods and wider use of cracking processes. High-test gasoline now marketed has an end-point of approx. 175°. Usual grades fall between 200 and 230°. Universal adoption of the last temp. would increase the total yield 15 to 20%. Efficiency of fractionation in refineries varies from 75 to 95%. If all could approach the latter figure it would mean an increase of gasoline yield of perhaps 10%. Burton's cracking process is the only one in successful use to-day and it has limitations. Refining losses are about 4%. By use of scrubbers and other recovery app. this loss should be cut to 2%. R. R. MATTHEW.

**Paraffin wax and its manufacture.** A. CAMPBELL and W. J. WILSON. *Engineering* 107, 247-8(1919).—A review. F. W. SMITHER.

**Lubrication (HARDY) 2.** Chemical properties of Utah hydrocarbons (BARDWELL, *et al.*) 8.

**Cracking hydrocarbons.** W. F. RITTMAN and M. C. WHITAKER. Dan. 23,464, Sept. 2, 1918. Hydrocarbons are suddenly and continuously vaporized and subjected to a dissociating temp. during downward flow through a series of columns in which a pressure of at least 4.25 atm. is maintained.

**Cracking hydrocarbons.** C. WHITE. Holl. 2,661, Oct. 15, 1918. Oil or residue is conducted in the liquid state, without the addition of steam, into unslaked lime heated in a retort to 400-650°.

**Apparatus for cracking hydrocarbons.** J. W. COAST, JR. U. S. 1,291,414, Jan. 14. The pat. relates especially to coke-traps connected with cylindrical pressure stills for cracking petroleum oils.

**Treating crude acid resins with solvents.** L. SINGER. Norw. 29,034, Aug. 26, 1918. Crude resin, produced by treating mineral or other hydrocarbons with H<sub>2</sub>SO<sub>4</sub>, is treated, immediately after being sepd. from the mixing app., by kneading and washing with alcs., acetones, or chlorinated hydrocarbons at a suitable temp. and in sufficient quantities to dissolve entrained oils. Entrained hydrocarbons, and adhering H<sub>2</sub>SO<sub>4</sub>, are then removed, the latter being tapped off. The mass is then treated, in one or more operations, with a suitable solvent to sep. it from the remaining H<sub>2</sub>SO<sub>4</sub> and coal-like or coke-like substances. Cf. C. A. 12, 93.

### 23. CELLULOSE AND PAPER.

A. D. LITTLE.

**Pulpwood consumption and wood-pulp production in 1917.** F. H. SMITH. U. S. Dept. Agr., *Bull.* 758, 19(1919); cf. C. A. 12, 1833.—A total consumption in 1917 of 5,480,075 cords of pulpwood was reported by 241 establishments, an increase of 5% over the consumption in 1916. The imported spruce and aspen composed 14% of the quantity used. The production of wood pulp totaled 3,509,939 tons, an increase of 2% over 1916. Tabular material is given showing the consumption of pulpwood by each kind of wood used, consumption by species and states, consumption by processes of manuf., and range of prices. Maine is the greatest pulp-producing state, followed by New York, Wisconsin, New Hampshire and Pennsylvania in the order given.

J. J. SKINNER.

**Celluloid manufacture.** E. W. MANTR. *Elec. J.* 16, 94-5(1919).—Description of elec. machinery used in the process of celluloid manuf. C. G. F.

**Cottons of different degrees of purification** (HALLER) 25. Coating wooden receptacles with waste sulfite liquor constituents (U. S. pat. 1,291,696) 1.

**Paper pulp.** K. BRAMSON (NÉE ADELER). *Brit.* 121,847, Feb. 7, 1918. Paper pulp is made from dead leaves. The blades or laminae may be sepd. from the ribs or stalks by known crushers or breakers and used as fuel, or the whole of the leaves may be used. For paste-board, the material may be heated with H<sub>2</sub>O with or without using pressure. For paper, 5-10% soda lye may be used under pressure. An app. for sepg. the blades or laminae from the ribs or stalks consists of a perforated spherical body rotating within a casing and provided with balls of cast Fe or granite. These first remove the substance of the laminae, which passes through the perforations, and then break up the ribs prior to treatment with liquid. Cf. 1, 853, 1871, 2,168, 1871, 4,259, 1882, and 18,572, 1892.

### 24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

**Optic atrophy and multiplex peripheral neuritis developed in the manufacture of explosives (dinitrotoluene).** A. S. HAMILTON AND C. E. NIXON. *J. Am. Med. Assoc.* 70, 2004-6(1918). E. J. C.

**Explosive.** J. D. THOMPSON. U. S. 1,291,258, Jan. 14. A high explosive suitable for use in blasting is formed of KClO<sub>3</sub> 73, randanite (decayed feldspar) 7, wood pulp 3, "liquid binitrotoluol" 15, trinitrotoluene 2, sol. nitrocellulose 0.125, and pulped insol. nitrocellulose 0.125 parts.

### 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

**The future development of the dyestuff industry.** L. W. ALWYN-SCHMIDT. *Color Trade J.* 4, 51-3(1919).—The dyestuff industry in the U. S. is firmly established on the road that must lead towards perfection. The character of the foreign market

and the quality of the product produced will be leading factors in the development of the industry. Makers should conc. on the most promising lines, and leave future expansion of the export business to a time when they can make additional dyes of a competitive quality. America is at a disadvantage on costs, but present conditions abroad will tend to equalize manufacturing costs. The world's business outlook is good, and this will be reflected strongly in the color industry. L. A. OLNEY.

**Dyestuffs and the world at large.** PAUL NOBBE. *Color Trade J.* 4, 58-9(1919).—The dyestuff industry more than any other will bring the U. S. face to face with the remotest corners of the earth. Cf. *C. A.* 12, 2443. L. A. OLNEY.

**The sulfur dyestuffs.** J. F. SPRINGER. *Color Trade J.* 4, 54-7(1919).—A discussion of history and compn., with a list of important S colors, including the fundamental materials from which they are made, the name of the manufacturer and patent nos. The method of mfg. several S colors is given. L. A. OLNEY.

**Sulfur dyes for fast printing.** E. GREENHALGH. *Text. Colorist* 41, 39-40(1919).—In the new era of calico printing, the loose color is being displaced by the fast color. Of the latter the S dyestuffs contain practically every requisite shade but red. One of the faults of the present day S colors is the presence of a certain amt. of free sulfide in the paste which in printing attacks the Cu rollers, partially effacing the engraving. Dyes are being improved to avoid this difficulty. An example of the glucose-alkali process is given in the following recipe: Thickening: dextrin 300 parts by wt., corn starch 50, water 150. Color paste: sulfur black paste 100, glucose (40%) 200, NaOH (76° Tw.) 100, thickening 600. Allow to stand with repeated stirring till dissolved and wholly reduced. Print dry and steam in the rapid ager for 2-3 min. at 100-101°. Hang in moist atmosphere 1 hr., then oxidize with one-eighth % bichrome and 1% H<sub>2</sub>SO<sub>4</sub>. Soap 10 min. at the boil. Brighter or fuller shades are obtained by the following modification of this recipe: Thickening: dextrin 300, corn starch 50, Na<sub>2</sub>CO<sub>3</sub> 50, water 200, heat to 71 and cool. Color paste: sulfur black 100, water 100, glycerol 100, thickening 600, formosol (50% soln.) 100. The color is printed, dried and aged 4 to 5 min. at 102-103°, then oxidized as in the glucose-alkali process. Free sulfide may be removed from S colors by washing out with hot water; by boiling the color with Na or K sulfite in the presence of thiosulfate, then acidifying with HCl or H<sub>2</sub>SO<sub>4</sub>, filtering and washing; or by oxidizing the sulfide with H<sub>2</sub>O<sub>2</sub> or Na<sub>2</sub>O<sub>2</sub>. Dyes are tested for sulfide by dissolving in NaOH and placing on clean Cu foil 1 hr.; after washing in boiling H<sub>2</sub>O a black stain shows sulfide. The following recipe gives good results with S colors, such as blues, greens, browns, purples and khakies containing up to 3% free sulfide: Sulfur blue 60, NaOH 20, hydrosulfite 15, water 85, glycerol 100, thickening 600. Heat to 70-80° till dissolved, cool and add formosol (50%) 100, K<sub>2</sub>SO<sub>4</sub> (90° Tw.) 20. Print, age, etc., as for sulfur black printing. L. W. RIGGS.

**Report of Committee D-13 on textile materials.** *Proc. Am. Soc. Testing Materials* 18, Pt. I, 357-79(1918).—A review of the transactions and discussions at the meetings of this committee is given. In Appendix I are the regulations governing this committee which are supplementary to the "Regulations governing Standing Committees." Appendix II consists of a table of corrected tensile strengths of fabric and yarn at moisture regains ranging from 3, and increasing by 0.25 up to 6.5% of the dry wt. Appendix III contains the report of a sub-committee on testing machines. These machines may be placed in two classes: those with constant increment of load, and those with constant increment of stretch. Machines of each class are described and illustrated, also a new machine which is being designed and constructed at the Bureau of Standards. Appendix IV contains a paper by C. E. Swett on the identification of manila fiber (cf. *C. A.* 12, 998). Appendix V (cf. following abstract). L. W. RIGGS

**Effect of moisture on the tensile strength of aircraft fabrics.** G. B. HAVEN. *Proc. Am. Soc. Testing Materials* 18, 380-98(1918).—"In order to apply and enforce specifications for mechanical fabrics, it is necessary to test them with precision and to achieve results which can be interpreted intelligently and accurately. Three methods have been proposed for use in testing textiles, *vis.*, bone dry; under standard atm. conditions at full regain; under any prevailing atm. condition with the result corrected for the actual moisture present at the time of the test." The last method proved to be the best, and all apparent strengths were corrected for moisture to a common basis of 6.5% regain. The fabrics tested were cotton for wings, linen for wings, rubberized for kites, balloons and dirigibles, woven tire and cord tire. These fabrics are described in detail also the app. used, rooms, taking of specimens and making of tests. The results are shown in 5 charts of curves. The summary states that heavy fabrics of cotton, such as tire duck, were found to gain about 7% of the dry strength for each added % of moisture and the same figures held for wing linen. Light cotton fabrics gained about 3% for each added % of moisture. Balloon fabric, a rubberized plied cloth exhibited the same general increase in strength. Cord fabric for tires followed practically the laws of woven fabric for the same purpose. L. W. RIGGS.

**Some effects of moist and dry heat on wool.** A. WOODMANSEY. *J. Soc. Dyers Colourists* 34, 227-30(1918).—The material used was an undyed cross-bred worsted serge, extd. with petroleum ether, well washed with warm distd. water and air-dried. Hygroscopic moisture may be considered as completely removed if the material is maintained at 100° for 40 min., provided there is sufficient ventilation. At higher temps. the elimination of moisture is more rapid, and when the temp. is raised considerably above the b. p. of water, *e. g.*, 150°, a gradual reduction in the wt. of the wool is noticed, owing to the evolution of matter other than water. Variation in hygroscopic moisture affects textile strength, which increases on drying and diminishes on dampening. The elongation before rupture increases upon dampening. Prolonged boiling of wool with water produced partial soln. of wool substance, with liberation of H<sub>2</sub>S and NH<sub>3</sub>. Wool simply dampened with H<sub>2</sub>O regains its original strength upon drying, but wool which had been boiled with H<sub>2</sub>O never regains its entire strength. Dry heat is not nearly so destructive of wool as wet heat. Wool under pressure with water at 130° is completely disintegrated, but dry wool at 200° is weakened less than 7%. Time is an important element in the effect of dry heat. Wool must be heated many hours at 100° to produce a scorched appearance. When temp. is gradually raised the first sign of darkening is visible at 145° and the color continues to deepen to 235°, when the material begins to char and fuse. When heated 3 hrs. at 150° the scorched wool still shows the scale markings but the surface is covered with long striations. At 200° for the same length of time the scale markings are faintly visible but upon disturbing the cover glass the fibers break into short rod-like pieces. Wool heated to 175° for 3.5 hrs. does not re-absorb the normal amt. of moisture, and its absorption power for H<sub>2</sub>SO<sub>4</sub> is also diminished. On heating in a current of air, NH<sub>3</sub> is evolved and this is increased if in moist condition. Heated wool becomes acid, partly on account of oxidation of S to H<sub>2</sub>SO<sub>4</sub>, and partly on account of loss of ammonia. As a protein complex, wool is held to consist of a combination of amino acids linked with the characteristic grouping—CO—NH—(a). The possibility of splitting up at (a) by heat is apparent; the resulting compd. would be an amide or a compound favoring the formation of an amino group. The amt. of NH<sub>3</sub> liberated from wool by heating much above 100° rapidly increases but later on diminishes. By boiling with water wool which had been heated varying lengths of time hydrolysis of the amino groups formed takes place with the formation of NH<sub>3</sub>. Heated wool bears a comparison to faded wool in that it is more sol. in alk. soln. and also has a greater soly. in distd. water. From a neutral dry bath scorched

wool takes up more of an acid dye than unheated wool, presumably on account of its acid character, but from an acid dye bath there is but little difference between the two. With basic dyes the heated wool gives a duller and redder shade. The changes which take place on heating wool are gradual. No critical temp. has been discovered. In all cases time and temp. are dependent variables.

L. A. OLNEY.

Further investigations on constituents of raw cotton. EDMUND KNECHT AND WILLIAM HALL. *J. Soc. Dyers Colourists* 34, 220-7 (1918).—In a previous communication (*C. A.* 6, 935) one of the authors pointed out that Schunck had only accounted for somewhat less than 0.5% of the impurities or substances other than cellulose contained in unbleached cotton yarn. Schunck boiled the cotton yarn in a kier with soda ash, and acidulated the kier liquor with  $H_2SO_4$  and from the ppt. he isolated (1) cotton wax, (2) margaric acid, (3) a coloring matter readily sol. in alc., (4) a coloring matter sparingly sol. in alc., (5) pectic acid, (6) albuminous matter. Since the amt. of impurities in raw cotton was known to be at least 10 times greater than that accounted for by Schunck, and it was considered that prolonged boiling with alkali might bring about drastic changes in these impurities, the authors decided to use as far as possible purely mechanical solvents, this being done in a Soxhlet extractor with benzene, alc., water, dil.  $NH_4OH$  and dil.  $HCOOH$  and finally with 2° Tw.  $HCl$  in a beaker. Previous expts. were repeated on larger quantities of 2-ply 60 American and Egyptian cotton using large copper Soxhlet app. The results previously recorded were confirmed except for slight quantitative differences. The benzene ext. yielded 0.407% (American) and 0.444% (Egyptian) or crude wax. This was sepd. into cotton wax (A) sol. in petroleum ether, and cotton wax (B) insol. in petroleum ether. Test of tensile strength showed that removal of wax increased strength and diminished the elasticity of the yarn. The alc. ext., 0.533% for American and 0.744% for Egyptian yarn, consisted of an amorphous brown hygroscopic substance, reducing Fehling soln., containing a high percentage of mineral matter, chiefly  $K_2O$ ,  $Na_2O$ ,  $MgO$ ,  $SO_3$ ,  $CO$  and  $P_2O_5$ . The aq. ext., 1.656% for American and 1.509% for Egyptian, similar in appearance to the alc. ext, did not reduce Fehling soln. so readily, and like the alc. ext., was faintly acid to litmus. The  $NH_4OH$  ext., made in earthenware jars, yielded 0.425% from American and 0.5% from Egyptian. The  $HCOOH$  ext., 0.65% American, and 0.405% Egyptian. The  $HCl$  ext., also made in earthenware jars, gave for American 0.656% and for Egyptian 0.54%. The total ext. for American was 4.327%; for Egyptian, 4.124%. The original cotton contains 0.204% N in American, and 0.262% in Egyptian; after the extns. the percentages were, resp., as follows: Benzene 0.189-0.240, alc. 0.184-0.226, water 0.175-0.218,  $NH_4OH$  0.175-0.218,  $HCO_2H$  0.168-0.211,  $HCl$  0.138-0.175 and finally after a 2° Tw. bleaching powder treatment 0.022-0.037, thus indicating that mechanical treatment alone only accounted for 14.1 and 16.7%, resp., and the chem. treatments by  $HCl$  and bleaching powder removes 72.3% and 71.3% of the nitrogen present in the original yarn. By using 4° Tw. caustic and boiling for 8 hrs. it was possible to remove most of the N in one operation. Boiling with lime was far less effective in this respect. The mineral constituents of the yarn were reduced from 0.931 American and 1.17% Egyptian to 0.076% American and 0.076% Egyptian. With the object of examg. the substances removed from cotton in the various operations of bleaching, 100 lbs. of soft twist Egyptian yarn were subjected to the following treatment: (1) Lime boil, (2) sour  $HCl$ , (3)  $NaOH$  boil, (4) sour  $HCl$ , (5) chemic, (6) sour  $HCl$ . The ash content of cotton was reduced from 0.89% to 0.15%. The N content after operation (1) was 54%, after (2) 40.5%, after (3) 27.1%, after (4) 36.8%, after (5) 6.7%, after (6) 5.8%. Only the first 3 exts. were examd. Lime ext.: The dry ext. contained 3.7% N but did not give any protein reaction; when treated with alc. it gave a gelatinous ppt., which appeared to coincide with the pectic acid obtained by

Schunck. The first HCl ext. gave a waxy, dirty white substance of a low m. p. which apparently consisted mainly of stearic acid, and by extn. with benzene a small amt. of a substance of higher m. p. was obtained corresponding to cotton wax. Caustic soda ext.: The substance pptd. from NaOH ext. gave 3.46% N and seemed to consist mainly of brown coloring matter. The moisture in the yarn averaged 7.36% before, and 6.14% after bleaching, thus indicating that the moisture content of unbleached yarn is not wholly dependent on cellulose but partly on hygroscopic accompanying substances.

L. A. OLNEY.

Cotton cellulose—structure and constitution. C. F. CROSS AND E. J. BEVAN. *J. Soc. Dyers Colourists* 34, 215–20(1918).—Fort (C. A. 12, 2694) deals with the destructive breakdown of cotton under the process of beetling. A sample of powdered cellulose thus produced has been examd. by C. and B. The form and extreme dimensions of the particles are similar to those of starch granules. They are non-reactive toward polarized light in comparison with the original cotton fibers. The elementary analysis calcd. on the ash free, dry product corresponds to the formula  $C_6H_{10}O_5$ , and the hygroscopic moisture 5–6%. Treatment with 17.5% NaOH soln. gave indication of a decided modification giving 44.2%  $\alpha$ -cellulose, 48.6%  $\beta$ -cellulose, and 72%  $\gamma$ -cellulose. Both  $\alpha$ - and  $\beta$ -cellulose showed considerable resistance acetylation, the yield of the two being 122% against 178% of the triacetate in the case of a normal cellulose. The cotton powder is characterized by a particularly low sp. vol. (0.635) or high d. as compared with normal cotton. Since the product in some ways resembled starch, expts. were made on potato starch with the following conclusions: (1) The starches are characterized by vol. changes with temp. similar to those of the celluloses. (2) In the case of starch in the natural air-dried condition there is no break in the expansion curve at the swelling point; on the other hand, a specimen previously dried at 100° showed considerable irregularity through the range of 20–60° with a general increase of vol. to a max. at the swelling point followed by a rapid fall. The reduction of fibrous cotton cellulose to powder appears to be the result of a mechanical shock, but there is no doubt a factor by or through which the mechanical effect is translated into some form of energy which affects the interior equil. of the cellulose complex, degrading it to a relatively rigid form, which then, having lost its structural continuity, breaks up into fragments.

L. A. OLNEY.

Cotton cellulose. C. F. CROSS AND E. J. BEVAN. *J. Soc. Dyers Colourists* 34, 247(1918); cf. preceding abstract.—Of a cotton rope used as a drive in a cool, well ventilated work room free from fumes, 3 different lengths from the same supply became rotten and broke. The rope, 1.5 in. thick, was entirely disintegrated and full, all its length, with dust. A sample of dust and granules from this rope, upon examn., proved to consist for the most part of rounded nodules of hyaline matter (A) with a few fragments of cotton fiber (B). (A) in air-dried state showed 13.26% moisture. Its conversion into dextrose gave results which identified it as cellulose. (B) examined under the microscope showed little structural change, but the ends were sharply fractured. The residual pieces of fiber were very brittle. They were also sol. for the most part in mercerizing soda soln.

L. A. OLNEY.

Defects in finished cotton goods. Sources of imperfections that show in later processes. LOUIS J. MATOS. *Text. World J.* 55, 39–41(1919).—Defects made in the course of bleaching are usually caused by inattention to the details of the work. These details should be constantly under the eye of workmen who feel the responsibility of their jobs. Scorching during singeing may be caused by belts slipping resulting in a decreased speed of the goods over the plate. When the right speed of the goods and a corresponding right temp. of the plate had been detd. by expt. these conditions should be rigidly followed. Partial destruction of the cotton by scorching so alters its compn.

that the goods will not dye evenly with direct dyes. The presence of Mg salts, while improving the feel of the cloth, converts some of the fiber into oxycellulose which does not take the color as readily as unaffected cotton when dyed with direct dyes. Mg compds. should not be used in any part of the process. Incomplete removal of sizes and dressings applied to the yarn before weaving, and the natural residue of fatty and waxy matters in the cotton are responsible for many defects. When the malting is given the requisite time completely to resolve the starch the fabric is in a most satisfactory condition for dyeing. If instead of malting the goods are subjected to a lime boil, the subsequent treatment should remove the lime completely; and for this purpose HCl is recommended for a "sour" instead of the  $H_2SO_4$  which is usually employed. The formation of oxycellulose is the worst common cause of stains on bleached cloth and is usually due to defective circulation of the bleaching liquid. Constant vigilance is the only remedy. Cloth dyed with vegetable colors should be promptly washed and mangled after dyeing. Generally sulfur colors are least affected by defective bowking or chemicking, as the dye appears to have about the same affinity for oxycellulose or unchanged cotton. With sulfur dyes it is very necessary to keep both dye and cloth out of contact with Cu in any form. Sulfur stains are removed by running the cloth through a jig charged with dil.  $Na_2S$  and NaOH. This may remove some of the color and require re dyeing. It is better to prevent the S stains by washing as quickly as possible after dyeing.

L. W. RIGGS.

**Cottons of different degrees of purification; behavior of cotton towards solutions of metallic salts.** R. HALLER. *Chem. Ztg.* 42, 597-9(1918); *J. Soc. Chem. Ind.* 38, No. 3, 70A.—Samples of Indian, American and Egyptian cotton were prepared in different stages of chem. purification, and treated at ordinary temp. for 48 hrs. with solns. of  $Al_2(SO_4)_3$ ,  $Al(AcO)_3$  and  $Pb(AcO)_2$ . The change in the metallic base content of the soln. was detd. as an approx. measure of the adsorption, and the amt. of metallic base fixed by the cotton after washing was detd. by ignition. In some cases with  $Al_2(SO_4)_3$ , and in all cases with  $Al(AcO)_3$ , a negative adsorption was obtained, i. e., the concn of metallic base in soln. was increased instead of decreased by the action of the cotton. With  $Al(AcO)_3$  the negative adsorption was smallest with raw fiber, and became greater as the degree of purification was increased. Cotton which had been boiled with lime gave higher values than that boiled with NaOH. Negative adsorption was most pronounced with Egyptian cotton. With  $Al_2(SO_4)_3$  positive adsorption obtained in all cases with raw cotton, and with lime-boiled cottons. Negative adsorption was shown by samples boiled, resp., with NaOH, lime and soda, and fully bleached.  $Pb(AcO)_2$  in all cases showed a large positive adsorption, increasing with the degree of purification of the cotton. Th: max. adsorption in all cases, both positive and negative, corresponds with the max. degree of purification of the cotton, which is obtained by boiling first with lime, then with NaOH, with a sour after each boil. Treatment with bleach liquor appears to decrease the purity of the cellulose, since it lowers the adsorption values. Adsorption does not necessarily run parallel with the fixation of insol. base in the fiber. With Al salts there was a fixation of alumina, even when negative adsorption values obtained. In the expts. with  $Pb(AcO)_2$  showing a high positive adsorption, a large fixation was observed in the case of the raw cottons, and the appearance suggested that lead oxide had combined with the non-cellulose constituents. After boiling, the fixation of lead oxide became smaller, with increasing purity of the cotton, although the adsorption became more marked.

R. B. ROG.

**Bleaching of colored striped cotton piece goods.** A. C. WALSH. *J. Soc. Dyers Colourists* 35, 35-9(1919).—Two types of colored bleaching are discussed. These are shirtings and so-called "dhootie bleaching" with colored borders. With the latter a specially white ground is not demanded, and colors used are often only of fair quality.

With the former greater fastness is demanded, and a whiter ground. The available colors are indigo, aniline black, alizarin red, and such vat colors as possess the greatest fastness to the bleaching process. Several colors of different fastness may be present in the same cloth, *e. g.*, indanthrene blue and indigo; the former stand a far greater amt. of chemicking than the latter. Before bleaching it is often best to put small pieces through the process, unless the dyes used are specified. Bleaching in the piece always gives a better appearance than bleaching in the yarn before weaving. In the bleaching process the main points to avoid are the reduction of colors in the kier and over-oxidizing in the chemic. It is in the alkaline treatment that reduction of the colors may occur, due partly to presence of org. matters as natural and accidental impurities, or even conversion products of cellulose itself. This reduction results in the marking off of colors. Low-pressure boil in  $\text{Na}_2\text{CO}_3$  free from  $\text{NaOH}$ , for about 4 hrs. Kier boiling may be avoided by running cloth open width through a scouring box, containing  $2^\circ$  to  $3^\circ$  Tw. alkali and then into a kier where liquor is circulated by means of a pump, at a temp. of about  $70^\circ$  for 6 hrs. This process will avert marking off. Starch may be well removed before kier treatment with some malt product. High-pressure kiers should be avoided. Chemicking is usually done in a clear bleaching powder soln.  $1^\circ$  to  $1\frac{1}{2}^\circ$  Tw. for 2-3 hrs., time and strength being dependent upon the quality of the goods and nature of color. Admixture of the chemick with air increases the rapidity of the bleaching and for this reason some colors will not stand the circulation of soln. For even bleaching best results are obtained if chemic is circulated as the goods are being plated into the cistern. The addition of lime water will check bleaching action. Sour consists of  $\frac{1}{2}^\circ$  Tw.  $\text{HCl}$  or  $\text{H}_2\text{SO}_4$  for  $\frac{1}{2}$  hr., which most colors will stand. With those that will not, use anti-chlor, *e. g.*,  $\text{Na}_2\text{S}_2\text{O}_5$ . Washing must be very thorough between the chemick and sour. To secure a more thorough white the whole process is sometimes repeated in less severe form. The final wash must be very thorough and a final soaping is frequently an advantage. L. A. OLNEY.

**Finishing and tensile strength**—tests to show the amount of tendering involved. ANON. *Text. World J.* 55, 37(1919).—The amt. of alteration which woven fabrics undergo during dyeing and finishing depends upon 4 factors, *vis.*, type and quality of raw materials employed; type and structure of warp and filling yarns; the structure and setting of the cloth in the loom; the particular process and degree of treatment in each to which the fabric is subjected during dyeing and finishing. These points have been investigated at the Bradford Technical College and some of the results are exhibited in a chart. It is clearly shown that the processes of crabbing, scouring and permanent finishing are responsible for an appreciable amt. of tendering. L. W. RIGGS.

**Fabrics from nettle and hemp.** ANON. *Text. World J.* 55, 73, 123(1919).—The employment of nettle fibers for fabrics is a revival of olden times when these fibers were largely used for home-spun goods. China still uses the fibers of *Boehmeria nivea*, a species of nettle, for the production of grass cloth, a durable fabric made by hand. It is claimed in this paper that nettle fibers are excellent for coarse cloths where the spinning count is not above 20s, and that it could replace cotton in the manuf. of half-woolen goods such as blankets, hosiery, etc. Successful cultivation of the nettle plant in Staten Island is reported and it is stated that the leaves form a valuable cattle food. Nettle stalks cannot be retted like flax or hemp, but are decorticated by machinery, then boiled under pressure with a suitable solvent to sep. the fibers which may be carded and spun in the regular way. Nettle fibers may be produced in strictly ultimate elements in length from 2 to 6 inches. It is estd. that clean fiber ready for spinning may be produced to sell with a profit at 7 cents per pound. Usually hemp is used for cordage and coarse goods, but with greater care in the treatment of hemp, fibers may be produced similar to the high grades of Egyptian cotton. L. W. RIGGS.



**Soluble antimony compounds—factors which enter into their evaluation.** WESSFORD. *Text. World J.* 55, 43-7 (1919).—Substitutes for tartar emetic are best valued by dye tests performed as follows: Start with the requisite number of 5-g. pieces of cloth of exactly the correct wt., and mordant them all in the same bath of 5% high-grade tannic acid with const. careful stirring. Bring up to the boil during 30 min., boil a few min. and allow to cool slowly with const. stirring. Allow 1.5 to 2 hrs. for the whole operation. Wring the samples with the same pressure directly from the tannic acid soln. without rinsing and spread the samples out alike. The Sb may be applied in 2 ways and both should be used to check each other. A 1% soln. of Sb, from each sample of Sb compd. tested, is made up and placed in its respective dye pot, each pot containing 200 cc. One piece of the tanned cloth is entered into each pot for 30 min., cold. Wash thoroughly and mark the pieces for identification. Finally the pieces are entered all together into 1% methylene blue and dyes as usual in the mill operation with sufficient stirring to get level shades. The strongest Sb salt will give the darkest shade. The 2nd method varies from the first only in the manner of fixing. Using one of the salts as a standard at about 1%, the corresponding strengths of the others are figured to represent equal costs. In these results the darkest shade represents a cost equal to the others, but a better money value. These tests should give a basis on which the product can be tested in the mill. Some of the Sb compds. liberate acids which should be neutralized by adding  $\text{Na}_2\text{CO}_3$  until a faint turbidity appears. Among the most successful of the tartar emetic substitutes are those containing  $\text{SbF}_3$ .

L. W. RIGGS.

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Chromium and iron salts; dyeing (Brit. pat. 121,617) 18.

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TURNER, A.: *The Study of Fabrics*. New York: D. Van Nostrand Co. 206 pp. \$1.75 net.

WOODHOUSE, THOMAS: *The Finishing of Jute and Linen Fabrics*. Manchester and London: Emmott & Co., Ltd. 326 pp.

## 27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

**Wartime vegetable oils.** J. KLIMONT. *Pharm. Post* 51, 561-2 (1918); *Chem. Zentr.* 1918, II, 735.—*Corn oil*,  $d_{20}$  0.917,  $d_{15}$  0.920,  $n_D$  1.4740, acid no. 29.0, sapon. no. 189.7, I no. 119.9; the acid no. of 20 samples ranged from 22.5 to 30.3. The oil can be made tasteless by refining. *Pumpkin-seed oil*,  $d_{20}$  0.9235,  $n_D$  1.4740, acid no. 69.5, sapon. no. 190.5, I no. 120.8. Refining produces a good edible oil. *Walnut oil*,  $d_{15}$  0.9244,  $n_D$  1.4720, acid no. 69.2, sapon. no. 192.7, I no. 133.9. *Hazelnut oil*,  $d_{15}$  0.9165,  $n_D$  1.4690, acid no. 3.7, sapon. no. 192.7, I no. 85.4; the acid no. of different samples 5.5-5.6. This is one of the best of edible oils. *Tobacco-seed oil*,  $d_{15}$  0.9261,  $n_D$  1.4770, acid no. 13.0, sapon. no. 192.9, I no. 136.6; the color is dark green; refining produces a good edible oil. *Raspberry-seed oil*,  $d_{15}$  0.9306,  $n_D$  1.4880, acid no. 47.2, sapon. no. 129.9, I no. 154.7; the color is dark; refining produces a brown edible oil. *Poppy oil*,  $d_{15}$  0.9237,  $n_D$  1.4740, acid no. 32.4, sapon. no. 192.0, I no. 128.1; the color is dark yellow. *Sunflower oil*,  $d_{15}$  0.9235,  $n_D$  1.4760, acid no. 4.8, sapon. no. 188.9, I no. 131.5; the color is light yellow.

C. O. EWING.

**African oil palm, its possibilities in Malaya.** B. J. EATON AND F. G. SPRING. *Agr. Bull. Federated Malay States* 6, 493-512 (1918).—A thorough discussion of this subject is given, including varieties, culture, costs and description of various kinds of machinery used in the industry.

E. SCHERUBEL.

**Rational utilization of dead animals.** FRABOT. *Ann. chim. anal. chim. appl.* 1, 55-65(1919).—The process described is similar in principle to that used in this country which consists in rendering and saving the by-products of grease and fertilizer.

E. SCHERUBEL.

**Coconut products in the Philippines.** W. S. COOKSON. *Agr. Bull. Federated Malay States* 6, 517-20(1918).—This article is a brief survey of the coconut oil industry in the Philippines. The relative efficiencies of the hydraulic press and the Anderson expeller for recovering the oil are discussed. At the present time the latter is being imported more than any other type of oil machinery on account of its simplicity, cheapness and ease of installation and operation. It will recover from 48 to 52% of oil against 55% extd. by means of the hydraulic press.

E. SCHERUBEL.

**The removal of the residual fibers from cotton seed and their value for non-textile purposes.** E. C. DE SEGUNDO. *J. Roy. Soc. Arts* 67, 183-202(1919).—A general review and discussion based on American and British practice. Cf. C. A. 12, 1601.

F. W. SMITHER.

**The cold processes for official soaps (JORDAN) 17. Lubrication (HARDY) 2. Utilization of grape seed in California (SERRE) 12.**

**Hydrogenating unsaturated fats and oils.** J. DEWAR and A. LIEBMANN. *Holl.* 2,658, Oct. 15, 1918. Oils are treated with H in the presence of a catalyzer which is formed on the surface of a carrier. The catalyzer may be formed of (a) oxide or carbonate of Ni or Cu or both, with the hydroxide, oxide, or carbonate of Cu, or (b) hydroxide, oxide or carbonate of Ni or Co with Pd, Pt or Ag, with or without the hydroxide or oxide of Cu. Cf. C. A. 12, 2139.

**Hydrogenating fatty substances.** J. BOYCE. U. S. 1,291,384, Jan. 14. A fatty substance to be hydrogenated mixed with a catalyst, e. g., cottonseed oil and pumice coated with Ni, is treated with H until the desired degree of hydrogenation is effected and the catalyzer is then sepd. from the hydrogenated product in a vessel from which air is excluded to prevent oxidation.

**Cetyl alcohol.** S. AXELRAD and I. HOCHSTADTER. U. S. 1,290,870, Jan. 14. The pat. relates to the obtainment of cetyl alc. by distn. of a Ca soap of spermaceti. Melted spermaceti 15 parts is mixed with about 20 parts of CaO containing about 5% H<sub>2</sub>O and the mixt. is heated and stirred for six hrs. The product is then placed in a still, heated at about 100° until the H<sub>2</sub>O is driven off and then heated to 340° to effect the distn. of cetyl alc., which distils in the form of white fumes, forming oily drops on cooling, which solidify to a white mass resembling paraffin, m. 49.5°. The distn. may be effected *in vacuo* at a lower temp. and the Na, K or Mg soap of spermaceti may be distd. in the same manner. A yield of 40-45% cetyl alc. (based on the wt. of spermaceti) is obtained.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

**Notes on extraction methods.** L. H. RAYNER. *Louisiana Planter* 62, 157-9(1919).—The latest cane mill design comprizes two crushers of two rolls each, followed by 18 mill rollers. An extn. of 98% is secured, as against 83% obtained by a 9-roller mill. But more maceration water must be used in the longer mill; a large number of spare parts must be carried, or a large machine shop maintained. Electrification does not overcome all the difficulties in balancing the steam consumption of the different departments, where outside fuel must be used in addition to bagasse. Constant extn.

cannot be obtained with any mill. The question arises whether it would not be more economical to secure a 98% extn. by an improved diffusion process, and use a 9-roller mill to press the chips so that they could be used for fuel like mill bagasse.

F. W. ZERBAN.

**A new method of clarification for cane juices in raw sugar factories.** PETREE AND COMPANY. *Louisiana Planter* 62, 140(1919).—This process aims to do away with filter presses in the cane sugar factory by distributing the filter-press mud after special treatment over the bagasse in the mill at a point where the liquid in the bagasse is richer in sugar than the mud.

F. W. ZERBAN.

**The sugar industry in the Island of Guadeloupe,** F. W. I. J. SIDNEY DASH. *Louisiana Planter* 62, 124-6(1919).—A general article on the agricultural side of the industry. An expt. station has recently been erected which will take up soil problems and other investigations.

F. W. ZERBAN.

**The production of beet-sugar in France using French sugar-beet seed.** MENNESSON. *Compt. rend. acad. agr. France* 5, 95-113(1919).—German beets yield 3% more crude sugar than French beets. This is due to (1) the influence of climate and of soil, (2) diminution of sugar content by fertilizers and manures, late sowings, irregularity of plants, etc., (3) bad storage in large moist silos, and (4) losses on weighing. Methods for improvement are suggested.

ALBERT R. MERZ.

**Preparation of soluble starch.** A. LEULIER. *J. pharm. chim.* 18, 291(1918).—Heat a mixt. of starch, 25 g., (of wheat, rice or maize) 95% EtOH 100 g., H<sub>2</sub>SO<sub>4</sub> 5 g., at a reflux condenser to boiling for about 15 min. Filter, wash with cold H<sub>2</sub>O or EtOH until the washings are free from acid, and dry. Sol. starch is pearly white, insol. in cold, very sol. in hot H<sub>2</sub>O. The blue I compd. is sol. in H<sub>2</sub>O. S. WALDBOTT.

#### Fertilizer experiments on sugar cane (CROSS) 15.

BORCHT, H. VAN DEN: *Die Entwicklung der deutschen Reisstärke-Industrie.* Berlin: Franz Siemenroth, M. 3.50. For review see *Chem. Weekblad* 16, 89(1919).

ROLPH, G. M.: *Something about Sugar: Its History, Growth, Manufacture and Distribution.* San Francisco: John J. Newbegin. 341 pp. For review see *Expt. Sta. Record* 39, 538(1919).

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

**The influence of single tapping and of oblique cuttings on latex and rubber.** O. DE VRIES. *Archief v. d. Rubbercultuur in Nederl.-Indië* 2, 241-55; *Chem. Weekblad* 15, 1392(1918); cf. *C. A.* 13, 386.—It is often stated that the system of tapping by oblique cuttings yields an inferior rubber. After such a cutting the rubber content of the latex drops suddenly from 25% to 21%, and the sp. gr. of the serum increases from 0.9910 to 0.9960. The velocity of vulcanization increases and the viscosity decreases; but these differences are not great enough to have much practical effect. No continuous falling off in quality could be detected.

JULIAN F. SMITH.

**Bacterial changes in latex.** G. STAFFORD WHITBY. *Agr. Bull. Federated Malay States* 6, 513-6(1918).—Kendall has shown (*C. A.* 7, 3605) that in bacterial metabolism, fermentation takes precedence over putrefaction. Whitby questions the statements of Gorter and Swart (*C. A.* 11, 1055) and Eaton (*C. A.* 11, 1055) that the effect of adding sugar is to produce conditions favorable to the formation of fermenting bacteria, and unfavorable to those causing putrefaction. W. states that putrefactive activity

produces an anti-coagulating effect quite apart from that caused by the alkalinity developed.

JOHN B. TUTTLE.

**Keeping (ripening) of coagulum.** O. DE VRIES. *Archief v. d. Rubbercultuur in Nederl.-Indië* 2, 213-40; *Chem. Weekblad* 15, 1391-2(1918).—"Ripening" coagulum gives the rubber greater viscosity and better mechanical properties after vulcanization, but the reported increase of 20% in tensile strength could not be confirmed. Further, the velocity of vulcanization of such coagulum varies greatly, and there is no uniformity of product. The compn. and rubber content of the latex, and extn. of the fresh coagulum with  $H_2O$ , are important factors. Whether the ripening will find com. application is doubtful, in view of the increasing use of artificial accelerators.

JULIAN F. SMITH.

**The tensile strength of rubber-sulfur mixtures.** O. DE VRIES AND H. J. HELLENDOORN. *Archief v. d. Rubbercultuur* 2, 769-91(1918); and *Meded. Centraal Rubberstation*, No. 11, 1-23.—The authors investigate the change in the position of the stress-strain curves and the magnitude of the tensile strength with increase in the period of cure at  $148^\circ$ . With their usual mixt. of 92.5% rubber and 7.5% S, they find that (a) for all the samples of rubber investigated (18) the tensile strength rose to a max., and then both it and the elongation at break diminished continuously, (b) the stress-strain curves came down the paper continuously, (c) in the cases of first latex crepe and smoked sheet, the curve corresponding to the max. tensile strength lay on or near the standard curve, whose position is represented by an elongation of 990% at 1.3 kg./mm<sup>2</sup>, which the authors had previously chosen for their testing, but was lower down on the paper for other varieties of rubber (scrap- and washwater-crepe). In the above expts. the number of separate tensile tests made for each cure was considerable. In 3 cases the total no. of rings tested was 497, 192, 416. The small probable errors in the figures for tensile strength are recorded in the paper. With mixts. containing smaller amts. of S (6, 5, 3%), different phenomena were observed: (1) The tensile strength rose to a max., but the latter was less sharply marked than in the case of the 7.5% mixt. (2) The tensile strength diminished continuously as the period of curing increased beyond that giving the max. tensile strength, but the elongation, after diminishing at first, increased again later. (3) The max. tensile corresponded to the almost complete combination of the S. (4) The stress-strain curves, after coming down the paper, showed a backward movement ("reversion") if the curing was continued sufficiently far beyond the point at which the S was substantially all combined.

G. S. WHITBY.

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Effect of moisture on the tensile strength of aircraft fabrics (HAVEN) 25.

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**Reclaiming rubber waste.** J. F. JOHNSTON. U. S. 1,291,535, Jan. 14. Waste rubber containing cotton is subjected to the action of a reclaiming soln. containing 2% NaOH and containing, also, for each 100 lbs. of rubber to be treated, 5 lbs. resin and 15 lbs. of kerosene. The waste is agitated in the soln. at a temp. of about  $160^\circ$ .

**Composition of reclaimed rubber and cotton.** J. F. JOHNSTON. U. S. 1,291,536, Jan. 14. A material suitable for the manuf. of shoe soles and heels is formed of reclaimed rubber mixed with cotton fiber which has been subjected to the action of caustic alkali and which has been sepd. from waste rubber in a reclaiming operation.

**Screw propellers.** E. CARETTA. Brit. 121,589, Oct. 31, 1918. Aircraft propellers are formed from blanks consisting of fibrous material incorporated in vulcanizable rubber molded at a high temp. so as to convert the rubber into ebonite. The blanks may be made up of alternate layers of woven material, preferably canvas, and vulcanizable rubber.

# CHEMICAL ABSTRACTS

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## I. APPARATUS.

L. C. JONES.

The limits of separation by fractional distillation. S. F. DUFTON. *J. Soc. Chem. Ind.* 38, 45-67(1919).—A new still-head for fractionating small quantities is described. This still-head was found to give far greater efficiency than that of the Young pear bulb column in common use. The still-head column was made by creating a spiral track in a narrow annulus between a glass tube, 17 mm. internal diam. and an inner tube closed at both ends, 13 mm. external diam., round which was wound a spiral of wire 1 mm. diam., with a pitch of 0.20 mm. When the still-head was in use the wire collected to it itself, as anticipated, the greater part of the descending liquid and became sealed by this liquid to the tubes, causing the ascending vapors to pass along the spiral track, so that, although the annulus was very narrow, the ascending vapor and descending liquid passed each other freely. Later, a still-head was constructed which was 120 cm. long and made of glass quill tubing in sections increasing in diam. downwards. The top section was of such a size that a bicycle spoke, 1.4 mm. diam., round which was wound a spiral wire 0.7 mm. diam., would fit with slight friction; the next section below had wire 1 mm. diam., the third 1.2 mm., and the last 1.4 mm., all wound spirally on similar cores, with increase of pitch from 6 mm. at the top to 12 mm. at the bottom. The graduation is necessary to carry away the increasing vol. of condensed liquid. The limits of sepn. by fractional distn. are discussed briefly.

J. H. YOUNG.

Apparatus for extraction of liquids in towers filled with Raschig's rings. F. RASCHIG. *Z. angew. Chem.* 31, I, 183-5(1918); *J. Soc. Chem. Ind.* 37, 677A.—The introduction of Raschig's rings (Brit. pat. 6,288, of 1914 (*C. A.* 9, 2433) and Ger. pat. 292,622 (*C. A.* 11, 1277)) overcomes certain objections to the application of the counter-current principle to processes in which a liquid is purified by treatment with another liquid immiscible with it. The app. consists of an Fe cylinder, 8 m. high and 60 cm. diam., in which a screen is fixed 1 m. from the base. On this screen rests a column (6 m. in height) of Raschig's rings (25 mm. diam.). An inlet tube (2 m. length and 30 cm. diam.) is fixed in the middle of the cylinder at the top, and serves to admit the heavier liquid, while the lighter liquid is introduced through a long, upright tube which enters the cylinder just below the screen. The heavier liquid sinks ultimately to the bottom of the chamber below the screen, whence it passes out through a long, upright tube, of such a height that the heavier liquid in this tube balances the column of the mixt. in the cylinder. The lighter liquor overflows through an outlet in the side of the cylinder near the top. The runnings are always clear, any emulsion or other deposit settling on the rings, which are cleaned when necessary, by emptying the app. and running in a suitable solvent. This app. may be advantageously applied to the purification of mineral oils by treatment with  $H_2SO_4$ , the recovery of aniline from weak solns. by extn. with benzene, the extn. of AcOH with ether, and of alc. from dil. solns. with benzene.

E. J. C.

Protection against drip water in an extraction apparatus. F. LIEBERT. *Chem. Weekblad* 16, 74(1919).—To keep water that collects on the outside of the condenser

from dripping down into the ext. liquid, cover the lower part of the condenser with a layer of paste made from shredded filter paper and  $\text{CaCO}_3$  with a little  $\text{Ca}(\text{OH})_2$  soln. After hardening, this paste will absorb the drip water. JULIAN F. SMITH.

Device for determining the dropping point (melting point) of fats, waxes, paraffin wax, etc., and especially bitumens. F. DUPRÉ. *Chem. Zig.* 42, 398(1918); *J. Soc. Chem. Ind.* 37, 615A.—A metal cup with a small central opening in the bottom is filled with the bitumen or the like, the latter being first melted if necessary. The cup fits into the lower end of a metal tube surrounding the lower end of a thermometer, the bulb of which is just above the top of the metal cup. The thermometer with attached metal tube and cup is mounted by means of a cork inside a test-tube. This is placed in a beaker of water or  $\text{H}_2\text{SO}_4$ , which is heated at first strongly to within  $10-20^\circ$  of the m. p. and then so that the temp. rises about  $1^\circ$  per min. The results obtained with tallow and paraffin wax agreed well with those obtained by Ubbelohde's app. (*Z. angew. Chem.* 18, 1220-5(1905)), over which the new app. has several advantages, especially for bitumens, etc., of higher m. p. E. J. C.

A new apparatus for determining ammonia. J. ORCEL. *Bull. soc. franc. min.* 41, 53-7(1918).—This is an improvement over the app. of Schloesing. The  $\text{NH}_3$  is liberated by alkali in a round-bottom flask, and passes upward through the leg of a large T-tube, lined with rings of recurved conical points alternating with plates, presenting thus an extensive cooling surface. The cross bar of the T-tube has projecting into it at one end a tube through which cold water circulates; the liquid which condenses on this runs toward the other end, because of a slight inclination, and descends through a long, narrow tube, drawn out from this end of the main T-tube's cross-bar. It then enters the top of a funnel-tube, the bottom of which is enlarged slightly and perforated by a ring of small holes, and dips under the absorbing liquid. Details of manipulation and analytical data are given, showing this method to yield accurate results. E. T. WHERRY.

New Vulcan-Orsat flue gas analyzer. ANON. *Elec. Rev.* 74, 438(1919).—A modification of the Orsat in which a master valve controls all passages and eliminates rubber vent tubes. The face of the valve has a dial insuring the desired communication when turned to the proper mark. Pipets and vent tubes are easily removed for cleaning or re-charging, and the leveling bottle has thumb control which regulates the flow of liquids and gases. The app. is readily transportable and is made in two sizes: one for  $\text{CO}_2$ , O, and CO, and the other for CO only. Repair parts are numbered, making replacement easy. W. H. BOYNTON.

Apparatus for the continuous testing of gases with special reference to acid or alkaline constituents. C. A. KING. *J. Soc. Chem. Ind.* 38, 337.—"A current of gas from the main is caused to pass upwards through a small glass absorption chamber about 7 cm. long and 1.5 cm. diam., provided with projections from the inner wall to effect more efficient contact with a soln. of a suitable indicator, which flows from a U-shaped tube into the upper end of the extn. chamber. The indicator soln. drains away from the lower end of the absorption chamber through a similarly shaped tube in which any change in color of the soln. is noted. The inlet and outlet bends are of such a length that the soln. forms a liquid lute against the pressure of gas in the app."

ERLE M. BILLINGS.

Apparatus for measurement of gases in volumetric analysis. H. FINCKE. *Chem. Zig.* 42, 415(1918); *J. Soc. Chem. Ind.* 37, 608A.—A 200-250 cc. graduated cylinder is closed by a rubber stopper carrying a siphon with arms of equal length, one of which reaches nearly to the bottom of the cylinder and the other nearly to the bottom of a taller and wider cylinder, and a tube bent at an angle of  $45^\circ$  and connected to a reaction

flask contg. a weighed quantity of the sample sufficient to yield about 100–150 cc. of gas. The acid or other reagent is contd. in a flask which is connected to the reaction flask by means of a tube bent at right angles. The graduated cylinder and the siphon are filled with a satd. soln. of NaCl. The flask contg. the reagent is inverted and the latter then flows into the reaction flask, the gas evolved expelling a corresponding vol. of salt soln. from the first into the second graduated cylinder. In this app. the use of rubber tubing and stopcocks is avoided.

E. J. C.

**Automatic ore-pulp sampler.** ANON. *Eng. Mining J.* 107, 412(1919).—The sample cutter is in the form of a narrow vessel with a very narrow and long slot. The cutter is placed under the discharge from a launder, with the slot parallel to the launder; and the whole device is moved across the stream of pulp in a direction at right angles to the length of the launder. The actuating device is a water tippler. A test in which the whole stream of pulp was collected and dried to compare with the sample showed a negligible error of sampling.

W. L. BADGER.

**Thermocouples.** ANON. *Ber. Physik.-Techn. Reichsanstalt* 1917; *Stahl u. Eisen* 38, 1044(1918); *J. Soc. Chem. Ind.* 38, 29A.—From tests with various base-metal thermocouples the following conclusions are drawn: Thermocouples with one element of Fe (constantan-Fe, Ni-Fe) should not be used above 800°. Couples having a free thin Ni wire should not be used for long periods at temps. above 1100° in contact with air, and will in future only be tested up to this temp. by the Reichsanstalt. Couples formed by 3-mm. wires of Ni and Ni-Cr, resp., may, however, be used up to 1200°. Ni-C couples consisting of Ni wire passing through a concentric C tube and thus protected against oxidation may be used for a considerable time at 1200°, and for short periods at 1250°.

E. J. C.

**Furnaces for the production of high temperatures.** A. BIGOT. *Chimie et industrie* 2, 27–36(1919).—The Perrot furnace is a down-draft gas-fired lab. pot furnace. It ordinarily gives about 1200° with illuminating gas. By adding a recuperator the temp. was raised to 1400°. A new furnace was built with  $Al_2O_3$  bricks for the lining, pulverized insulating layers between the refractories and the concrete shell, and a recuperator of the same refractories. The furnace chamber was 50 cm. square. With illuminating gas a temp. of 1750° was reached in 5.5 hrs. This was not the max. possible, but was limited by the refractories. Detail drawings are given. A tube furnace is described. This is essentially a long muffle, with flues in the walls for heating. The refractories are "special" and have a layer of insulating powder or insulating bricks between them and the concrete frame. This concrete frame is ironed as usual. The material to be heated passes through the tube on special refractory plates rolling on balls. This does away with the troubles incident to carriages on wheels. B.'s tunnel furnace is of the same design but the gases of combustion pass directly over the ware instead of through the flues as in the tube furnace. The special points in the tunnel furnace are insulation as described above and the ball bearing carriages. The tunnel furnace described was too short (15 m.) for the fullest regeneration of the heat in the ware. At 1200° it has a thermal efficiency of 78% and at 1400°, 70%. It is claimed that a furnace 30 m. long would give an efficiency of 85%. Much stress is laid on "special" refractories which are not described.

W. L. BADGER.

**Photometer liquids in tablet form.** W. HAUSMANN. *Z. wiss. Phot.* 17, 268 (1918); *J. Soc. Chem. Ind.* 37, 637A.—For greater convenience in handling, although with some loss of sensitiveness, photometer liquids are mixed with a sterilized agar-agar suspension, the mixt. being allowed to set in Petri dishes. Eder's soln. ( $HgCl_2 \cdot C_2O_4(NH_4)_2$ ) gives a colorless jelly in which a white opaque ppt. is formed on exposure to light. Rousin's liquid (Na nitroprusside- $FeCl_3$ ) gives a brownish colored jelly turning to a strong blue color.

E. J. C.

**Centrifugal pumps for dealing with liquids containing solid, fibrous, and erosive matter.** RICHARD C. PARSONS. *Engineering* 107, 150-1(1919).—The Stereophagus pump (*Engineering* 92, 444(1912)) consists of a conical impeller with curved blades working against a fixed blade in the casing. The action is similar to that of a lawnmower. The suction opening is a narrow slot to prevent the entrance of large pieces of solid matter. It is used for low-lift pumping of sewage. If larger pieces of solid matter or corrosive or erosive liquids are to be handled, the Flexala pump is recommended. This is a single suction open impeller volute pump. The back of the impeller is cast iron, on the face of which is vulcanized a rubber layer carrying flexible rubber vanes. If the liquid is very corrosive the whole inside of the pump is rubber lined.

W. L. BADGER.

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**Fuel economy in the boiler house (KERSHAW) 21.**

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**Acetylene generator.** O. M. FURR. U. S. 1,292,302, Jan. 21. \*

**Acetylene generator.** A. F. JENKINS. U. S. 1,292,327, Jan. 21.

**Gas-washing apparatus.** A. L. STEVENS. U. S. 1,292,125, Jan. 21.

**Apparatus for separating solid particles from gases.** W. J. BALDWIN. U. S. 1,292,561, Jan. 28.

**Filter for acids.** E. J. SWEETLAND, F. W. MANNING and W. S. HILPERT. U. S. 1,292,535, Jan. 28. A fabric adapted for use in filtering rancid fats or oils or other acid substances is formed of a woven wire cloth which may be formed, e. g., of brass or Cu, coated with a protecting layer of a phenolic condensation product.

**Viscometer.** A. S. DYSART. U. S. 1,292,276, Jan. 21. The viscosity of liquids is detd. by the rate of flow of the liquid through an orifice in the bottom of a bucket-shaped vessel which is allowed to float in the liquid. A depending annular flange at the upper end of the bucket forms an air-lock and prevents the vessel from sinking beyond a certain predetd. depth in the liquid.

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## 2. GENERAL AND PHYSICAL CHEMISTRY.

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WILLIAM D. HARKINS AND E. B. MILLARD.

**The life of Joseph Black.** ERNST COHEN. *Chem. Weekblad* 16, 168-78(1919).

E. H.

**Theobold van Hogelande.** F. M. JAEGER. *Chem. Weekblad* 16, 179-80(1919); cf. C. A. 13, 87.

E. H.

**George Carey Foster.** OLIVER J. LODGE. *Phil. Mag.* 37, 317-20(1919).—An obituary.

E. J. C.

**Sir William Crookes.** ANON. *Elec. World* 73, 723(1919).—Obituary. Crookes was born in London in 1832, died April 5, 1919.

C. G. F.

**The Government and the organization of scientific research.** FRANK HEATH. *J. Roy. Soc. Arts* 67, 206-19(1919); *Chem. News* 118, 134-7(1919).

E. H.

**Science and technics.** I. H. J. PRINS. *Chem. Weekblad* 15, 1662-4(1918). II. The importance of practical experience for the teaching of chemical technology. *Ibid* 16, 37-40(1919).

E. H.

**Our opportunity.** BERNHARD C. HESSE. *J. Ind. Eng. Chem.* 11, 341-4(1919).—An address. The present is particularly our opportunity so to cooperate in every direction as to clinch the advantages gained as a result of the war as regards public



and governmental recognition of the essentiality of chemistry to national welfare and growth and its beneficent influence thereon. More interest and direct participation in Society activities are urged on individual members of the Am. Chem. Soc. and on the various sections.

E. J. C.

**Intensive preparatory chemistry.** CHARLES S. PALMER. *Trans. Am. Inst. Chem. Eng.* 10, 33-41.—Chemistry is emphasized as the fundamental science. The author proposes preparatory school chemistry of 1 year general inorg. chemistry, 1 year org. chemistry and 1 year qual. (with some quant.) analysis, for the benefit of those not going to college and advocates permitting more intensive university training in advanced chemistry and chem. engineering.

J. R. W.

**Structure of the phase-space of a partially periodic system.** P. S. EPSTEIN. *Sitzb. kgl. preuss. Akad.* 23, 435-46; *Sci. Abstracts* 21A, 382(1918).—A mathematical paper. It is shown that Planck's results for a partially periodic system are quite general, and lead to the Schwartzschild-Epstein specialization of Sommerfeld's quanta hypotheses. The latter portion of the paper is devoted to an examn. of systems with coherent or degenerate degrees of freedom, and the discussion of particular species of singularities.

H. JERMAIN CREIGHTON.

**Boundary difficulties of Einstein's gravitation equation.** L. SILBERSTEIN. *London. Phil. Mag.* 37, 230-6(1919).—A mathematical treatment.

S. C. L.

**Energy principle in the general theory of relativity.** A. EINSTEIN. *Sitzb. kgl. preuss. Akad.* 24, 448-59; *Sci. Abstracts* 21A, 353-4(1918).—E.'s impulse-energy principle is exhaustively examd. in the present paper. There are considered the formulation of the principle and the objections raised against it; the extent to which energy and impulse are independent of the choice of coördinates; and the energy of the spherical universe. The integral principle for an enclosed universe is evolved, and the ponderous mass of a closed system is evaluated and is found to be equal to the quantity which has been designated its energy. In conclusion, it is stated that for the formulation of the impulse-energy principle of a quasi-spherical (but not of a quasi-elliptical) universe, coördinates are to be preferred which are obtained by the stereo-graphical projection of the sphere upon a (three-dimensional) hyperplane.

H. JERMAIN CREIGHTON.

**Principal points of the general theory of relativity.** A. EINSTEIN. *Ann. Physik* 55, 241-4(1918); *Sci. Abstracts* 21A, 351-2.—The general theory of relativity rests upon 3 hypotheses which are not independent of each other, namely: (a) the relativity principle, by which natural laws are only statements of time-space coincidences and find a single natural expression in general covariant equations. (b) The principle of equivalence by which inertia and wt. are essentially equal. From this principle and the results of the special theory of relativity, it necessarily follows that the symmetrical fundamental tensor,  $g_{\mu\nu}$ , detcs. the metrical properties of space, the inertia behavior of bodies in it, and the gravitational effects. The space condition given by the fundamental tensor is designated as the G-field. (c) Mach's principle by which the G-field is detd. without residue by the masses of the bodies. Since mass and energy are the same according to the conclusions of the special relativity theory and the energy is formally described by the symmetrical energy tensor  $T_{\mu\nu}$ , it follows that the G-field is detd. by the energy tensor of matter. If it is correct that every empirical law must be brought into general covariant form, then the principle a possesses a significant heuristic force which is most valuable for the gravitational problem. Principle b has formed the starting point of the whole theory and brought about the existence of principle a, and it cannot be omitted so long as the fundamental ideas of the theoretical system are maintained. Mach's principle detcs. the space-time structure of the universe. -E. concludes that the geometrical shape of the universe deviates only slightly

from that of a spherical space, and that only locally, *e. g.*, as the shape of the earth's surface differs from that of an ellipsoid.

H. JERMAIN CREIGHTON.

**Polar and non-polar valency.** RAJENDRALAL DE. *J. Chem. Soc.* 115, 127-34 (1919).—In the light of recent theories of at. structure, De has discussed the structural significance of complex salts such as the cobaltammines and Pt-ammonium salts, and of compds. such as  $(CPh_3)_2$ ,  $C_2H_2$ , and the acetylides, and others, in relation to polar and non-polar valency.

R. E. HALL.

**The stratification of liquid films.** JEAN PERRIN. *Ann. phys.* 10, 160-84(1918).—Two black spots are visible on a soap film just before its rupture. They reflect the light very little, and are composed of a great number of spots, one within the other, of increasing blackness. If protected from air currents they may be preserved for some time. Their thickness, as measured by Reinold and Rücker, is from 6 to 12 millimicrons. P. describes five black spots, one within the other, which are distinguished by their brightness and color. They are observed microscopically, in a horizontal position, with autocollimation. A very intense Brownian movement is observed within the spots, which is a two-dimensional movement due to the bombardment by the air of particles of liquid in the film. The effect of adding various fluorescent materials is described, and the fringes produced are described in detail. The thickness is measured by an optical method. It is found that the thickness is always an even multiple of an elementary thickness of about 5 millimicrons. The effect of surface tension is discussed, and it is shown that the surface layer, in the case of sodium oleate, consists of oleic acid and the remainder contains free base. An actual sepn. is obtained by repeated sepn. of the surface layer, as by bubbling air through. It is shown, by measurements of the area of the surface and of the amt. of acid removed, that the layer is 2 mol. thick.

F. C. HOYT.

**Compressibility of aqueous solutions of casein and peptone.** SVEN PALITZSCH. Harvard Univ. *J. Am. Chem. Soc.* 41, 346-51(1919).—The compressibilities of both casein and peptone solns. decrease with rising concn. For the pressure range of 300 megabars, and the concn. of 10 g. to 100 g. of water, the compressibilities are (1) acid casein,  $40.6 \cdot 10^{-6}$ ; (2) alk. casein,  $40.5 \cdot 10^{-6}$ ; (3) peptone,  $39.0 \cdot 10^{-6}$ . The H-ion concn., soln. vol., and viscosity were measured; also the surface tension for the peptone solns.

R. E. HALL.

**New method for determining the allotropic transformation of nickel.** JÄNECKE. *Z. angew. Chem.* 31, I, 229(1918); *J. Soc. Chem. Ind.* 38, 43A.—Allotropic changes in metals are accompanied by a change in the rate of expansion, but this is so small as to be difficult to detect. The following method allowed the change to be observed over short as well as long intervals of time: A Ni cylinder 45 cm. high was inserted in a low-power press (3000 kg.) used for tensile and compressive strength tests, and heated by means of a resistance furnace; the variation in length produced a movement of the upper movable plate of the press and was registered on a scale indicating movements as small as 0.007 mm. The transformation temp. of Ni was found to be  $347-356^\circ$ ; the expansion graph consists of 2 straight lines, that above the transformation temp. being more steeply inclined.

E. J. C.

**Thermal conductivity of neon.** S. WEBER. *Proc. Acad. Sci. Amsterdam* 21, 342-56(1919).—See *C. A.* 12, 2469.

E. J. C.

**Determinations of the heat conductivity of selenium.** E. D. SAYCE. *J. Proc. Roy. Soc. N. S. Wales* 51, 356-63(1917).—In work by other investigators, attention has been concentrated mainly on the effect of illumination on thermal cond. In this paper the influence of method of prepn., the age of the specimen and the temp. of testing have been investigated, all measurements being made with the Se in darkness.

The method used was that of C. H. Lees (*Trans. Roy. Soc. London (A)* 1898, 399). The thermal cond. of vitreous Se at 25° was found to lie between 0.000293 and 0.000328, that of cryst. Se between 0.00070 and 0.00183. In general, the cond. increases with the temp. of prepn., but diminishes with age. The variation of cond. with temp. may be expressed by the equation  $K_t = K_{25} [1 + a(t - 25)]$ , in which  $a$  for vitreous Se ranges from 0.006 to 0.009, and for cryst. Se from 0.003 to 0.010. Values are expressed in absolute units.

D. MACRAE.

The effect of some simple electrolytes on the temperature of maximum density of water. ROBERT WRIGHT. *J. Chem. Soc.* 115, 119-26(1919).—The results affirm the law of Despretz that the lowering of the temp. of the max. d. of H<sub>2</sub>O produced by the addition of a solute is directly proportional to the concn. of the latter. With highly ionized electrolytes there are 2 independent effects, one due to the acid, the other to the basic radical. The lowering produced by such an electrolyte in mol. concn. can be calcd. by the addition of 2 moduli to the lowering produced by a mol. soln. of a standard substance, as *N* HCl, which gives a lowering of 5.2°. Acid salts of dibasic acids behave normally, but the neutral salts of such acids and the salts of bivalent metals do not follow any simple rule. Feebly ionized org. acids show abnormal effects, but their highly ionized salts are normal.

R. E. HALL.

Molecular attraction and attraction of mass and some new gas equations. JAMES KAM. Univ. Bristol. *Phil. Mag.* 37, 65-97(1919).—A mathematical treatment of the gas laws introducing some new equations, including the influence of temp. on some of the van der Waals consts.

S. C. L.

The influence of temperature on homogeneous gas reactions. GEORGE W. TODD AND S. P. OWEN. London. *Phil. Mag.* 37, 224-30(1919).—The general assumption is made that only mols. possessing kinetic energy in excess of a definite minimum value can enter into chem reaction with other gas mols. From Maxwell's distribution theorem a simple expression is deduced for the number of gas mols. per cc. having velocities greater than any particular value. From this it is shown how the velocity const. of a gas reaction varies with the temp. The usual form of expression for variation of equil. with temp. is also obtained.

S. C. L.

Joule-Thomson effect and the equation of state for gases at small pressures. M. JAKOB. *Ann. Physik* 55, 527-44(1918); *Sci. Abstracts* 21A, 381.—The equation of state of a gas may be derived if, besides its sp. heat ( $c_p$ )<sub>0</sub> for  $p = 0$ , the integral Joule-Thomson effect for an infinitesimal pressure is given as a function of the initial pressure  $p$  and temp.  $T$ , also an isothermal of the state is given for the detn. of the arbitrary integration function when the integration is made with respect to  $T$ . In this manner there is derived the equation of state:  $v = RT/10^4p + A'p^2 + B'p^3 + C'p^4 + D' + E'T$ , where  $R$  is the gas const., and  $A'$ ,  $B'$ ,  $C'$ ,  $D'$  are functions of  $T$ , and  $E'$  is a detd. rational integral function of  $p$ . This equation has been found to hold at pressures as high as 1000 atms. at 200°. For  $p = 0$  the following equation has been evolved:  $\delta(pv)/\delta p = D' = (-191310/T^4) + (10229/T^3) - (147.63/T^2) + (0.08973/-T) + 0.00065708$ . The inadmissibility of the identification of an ideal and of a real but infinitely diluted gas is discussed; the general form of the equation of state of a real gas is developed; the equations of state and the Joule-Thomson effect according to van der Waals and Berthelot, and the Joule-Thomson effect of infinitely dil. air according to theory and expt. are considered; and the Joule-Thomson effect of other gases is calcd. from that of air, according to the method of corresponding states. The equation of state is found to hold good for very low pressures as for very high, and to be of general applicability.

H. JERMAIN CREIGHTON.

A tyndallimeter for the examination of disperse systems. RICHARD C. TOLMAN AND ELMER B. VLIET. *J. Am. Chem. Soc.* 41, 297-300(1919).—A convenient form of

tyndallmeter is described which may be constructed from stock materials and which can be effectively employed in detg. the strength of Tyndall beam in suspensions, colloidal solns., smokes and mists.

E. B. SPEAR.

**Relation between the intensity of Tyndall beam and concentration of suspensions and smokes.** R. C. TOLMAN, L. H. REYERSON, E. B. VLIET, R. H. GERKE AND A. P. BROOKS. *J. Am. Chem. Soc.* **41**, 300-4(1919).—By means of the tyndallmeter mentioned in the preceding abstract measurements were made to det. the relation between the strength of the Tyndall beam and the concn. of a silica suspension in water, and also the concn. of  $\text{NH}_4\text{Cl}$  smokes in air. The results show a strict proportionality over a wide range, i. e., 0.05 to 2 g. per l. for silica suspensions and from 0.02 to 1.2 mg. per l. in the case of  $\text{NH}_4\text{Cl}$ . At higher concns. the proportionality fails because the solns. are so opaque that a considerable portion of the light is absorbed.

E. B. SPEAR.

**The disappearance of smoke in a confined space.** RICHARD C. TOLMAN, E. B. VLIET, W. MCG. PHIRCE AND R. H. DOUGHERTY. *J. Am. Chem. Soc.* **41**, 304-12 (1919).—The rate of disappearance of smokes was found to be a function of the stirring, the size of the particles, and of the concn. Smokes were made from acetanilide, benzoic acid, and rosin by exploding each with a blasting cap. Oil smokes were produced by means of a thermal effect whereby the size of the particles could be varied. Stirring accelerates the disappearance because the particles are brought more frequently in contact with walls of the container. Small particles, because of the greater velocity of diffusion, coagulate more quickly, hence the rapidity of the disappearance is increased. If the size of the particles remains the same increasing the concn. causes a more rapid disappearance owing to the greater chance of hits between the particles and also because of the enhanced effect of the containing walls. From this the authors conclude that it is impossible to raise the optical density of smoke beyond a certain value by further introduction of smoke material.

E. B. SPEAR.

**A study of the forms assumed by drops and vortices of a gelatinizing liquid in various coagulating solutions.** EMIL HATSCHKE. *Proc. Roy. Soc. London (A)* **95**, 303-15(1919).—According to D'Arcy Thompson the shapes of the simpler organisms are forms of equil. such as are assumed by fluid bodies under suitable conditions. The various stages of formation of these shapes were studied by allowing drops of concd. gelatin to fall into solns. containing different coagulating substances. The results are detd. by many factors, such as the concn. of the gelatin, density of the coagulating soln., nature of the solute, temp. of both solns., and distance of the orifice of the instrument delivering the drops from the coagulating soln. A 14% gelatin soln. at 25 to 30° dropped into an  $\text{Al}_2(\text{SO}_4)_3$  soln. having  $d_{18}$  1.030 gave a vortex mushroom effect. Cf. *C. A.* **12**, 2474. The drop had ribs on the bell and disk. The portion remaining on the surface exhibited a stellate appearance. The formation of the ribs and the star is due to shrinkage. The ribs do not appear when the gelatin is dropped into a 9% gum arabic soln. When  $\text{K}_4\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$  or tannin is employed as coagulant the drops resemble the red corpuscles of the blood. The addition of certain salts causes the drops to simulate the forms of some lower organisms.

E. B. SPEAR.

**An oscillation method for measuring the size of ultramicroscopic particles.** P. V. WELLS AND R. H. GERKE. *J. Am. Chem. Soc.* **41**, 312-29(1919).—Solid suspensions in air are dealt with. A modification is described of the method of measurement based on the velocity of particles in an elec. field, the oscillation amplitudes of the particles in an alternating field are utilized. The method renders possible the precise detn. of the Stokes' law size of a single particle. The smoke particles were found to be  $0.8 - 2.80 \times 10^{-7}$  cm. in diam., with an average deviation of 1.8%. Frequency

and Ogive curves are given for smokes made by detonating commercial lubricating oil with blasting caps. These curves clearly show the agglomeration of the particles with time.

FELIX A. ELLIOTT.

Production of high pressures by electrolysis. K. WILKENS. *Chem. Ztg.* 42, 428(1918); *J. Soc. Chem. Ind.* 37, 661A.—If water is electrolyzed in a completely filled vessel, the gases produced can only occupy the space of the decomposed water, that is, in 1 ampere-hour, 624 cc. of gases must occupy a vol. of 0.3354 cc. and will be under a pressure of 1860 atms. When only  $\frac{9}{10}$  of the vol. of the vessel is filled with water and the remaining  $\frac{1}{10}$  occupied by air, the pressure after electrolyzing for 1 hr. (with 1 amp.) will be 7 atms.; after 19 hrs., 61; after 50 hrs., 269; and after 1000 hrs., 1433 atms.

E. J. C.

Proof of the assumptions underlying the thermodynamic potentials. M. B. WEINSTEIN. *Ann. Physik* 55, 497-526; *Sci. Abstracts* 21A, 381-2(1918).—W. has developed theoretical methods by which the objections raised against previous methods that have been applied to the proof of the fundamental form of the thermodynamic potentials may be overcome. It is shown that from purely thermodynamic considerations the proportionality between osmotic pressure and concn. cannot be established; also that the same holds for the temp. relation, and, generally, processes involving diffusion are irreversible. The connection between the Arrhenius cond. laws is capable of treatment by the thermodynamic equations. Further formulas are evolved for the fundamental equations of equil. The treatment of the subject is mathematical throughout.

H. JERMAIN CREIGHTON.

The lag of thermometers with spherical and cylindrical bulbs in a medium whose temperature is changing at a constant rate. A. R. McLEOD. Cambridge Univ. *Phil. Mag.* 37, 134-44(1919).—A mathematical treatment with special reference to aeronautical application. For speeds of 60-100 miles per hr. for cylindrical or spherical thermometers with the same vol. expansion the total lags would be: For Hg (sphere)  $1.61^\circ$  and for cylinder ( $10 \times 0.36$  cm.)  $0.85^\circ$ ; for alc. (sphere)  $1.62^\circ$  and for cylinder ( $10 \times 0.36$  cm.)  $0.45^\circ$ .

S. C. L.

X-Ray analysis and the assignment of crystals to symmetry classes. ALFRED E. H. TUTTON. *J. Wash. Acad. Sci.* 9, 94-9(1919).—T. summarizes a paper by Wherry (*C. A.* 12, 2155) but concludes that the allocation of a crystal in two different classes is unacceptable, holding that: the space-lattice det. the crystal system, while the points in the lattice det. the particular class; there are 14 space-lattices, and these are holohedral, each point of the lattice representing a single molecule or a small group of 2, 3 or 4 mols.; the point-systems of lower symmetry are not space-lattices, but Sohncke regular point-systems; diamond shows no polarity and is therefore holohedral; and the structure of pyrite is not a space-lattice.

S. G. GORDON.

Reply to Dr. Tutton's discussion of the assignment of crystals to symmetry classes. EDGAR T. WHERRY. *J. Wash. Acad. Sci.* 9, 99-102(1919); cf. preceding abstr.—W. points out that the habit and etch-figures of the diamond are tetrahedral, and the absence of elec. polarity cannot alter the fact. His new explanation of the discrepancy is that the structure as a whole is holohedral, while the symmetry of the unit cells is tetrahedral (which is reflected in the habit and etch-figures), as shown by X-rays. X-ray study has further shown the existence of other than the 14 Bravais space-lattices. The structure of pyrite is a compd. lattice, composed of two interpenetrating simple ones. The view that mols. rather than atoms occupy points of space-lattices has been definitely disproved by X-ray study of crystals.

S. G. GORDON.

Liquid crystals of agaricinic acid. PAUL GAUBERT. *Compt. rend.* 168, 277-9 (1919); cf. Thoms and Vögelsang, *C. A.* 2, 657.—The crystals lose their water of crystn.

a little above  $100^{\circ}$ , becoming transparent and monorefringent. If the acid has not been heated above the fusing temp. it shows the following phenomena upon slow cooling: (1) Under the microscope the monorefringent droplets, at first clear, become cloudy by the formation of globules more refringent than the liquid. These last are monorefringent and some among them occasionally show angular contours; at the beginning of their formation they show alignments recalling the axes of a crystal of the cubic system, the whole making a soft mass having the consistency of vaseline. This formation resembles that of AgBr when heated between  $400$  and  $450^{\circ}$ . On further cooling the prepn. becomes solid, the crystals preserving their characters. They may also be transformed either to a monorefringent solid mass, probably corresponding to that which was observed before fusion, or to birefringent solid spherulites. (2) The monorefringent droplets may become cloudy as in the preceding case, but yield elongated lozenge crystals identical with those of cholesteryl glycolate, but much less birefringent. These crystals are quite fluid, liquefying under the least pressure and form themselves around bubbles of gas into spherulites in which the principal index of refraction  $n_z$  coincides with the radial direction. Between two plates of glass the crystals disappear and are replaced by the outlines into which the cryst. mols. have oriented, in such a manner that their optic axes are perpendicular to the plates. By cooling, the mass gradually solidifies, the liquid crystals becoming more viscous, sometimes preserving their characters, but more frequently passing into a new modification of solid spherulites more birefringent than the liquid crystals. These melt at  $100^{\circ}$ , have  $n = 1.501$ , though when hydrated  $n$  is about  $1.515$ . L. W. RIGGS.

**The classification of mimetic crystals.** EDGAR T. WHERRY AND E. Q. ADAMS. *Bur. Chem. J. Wash. Acad. Sci.* 9, 153-7 (1919).—Instead of describing all cases of imitation of the symmetry of one crystal class by crystals really belonging to another class by the general prefix pseudo-, which is all that is usually done, it is recommended that the different types of relationship be clearly distinguished, and a series of appropriate prefixes for this purpose is proposed. E. T. WHERRY.

**Artificial coloration of liquid crystals.** PAUL GAUBERT. *Compt. rend.* 167, 1073-5 (1918); cf. *C. A.* 3, 139; 4, 138, 732; 7, 1484; 8, 505, 1224, 1370.—A discussion of optically negative and optically positive liquid crystals, colored with iodophenol, is given, with special reference to the phenomena of birefringence and pleochroism. The results with reference to the rule of Babinet, and with relation to the influence of birefringence upon pleochroism, are conformable to those obtained by previous study of solid solns. (*C. A.* 12, 2548), the properties of the latter being different from those of mixed crystals. L. W. RIGGS.

**Determination of the principal indices of refraction of anisotropic substances by the observation of the retardation in thin plates in oblique parallel light.** A. LEDOUX. *Bull. soc. franc. min.* 40, 119-57 (1917).—An elaborate mathematical discussion of this method is given, and simplified directions for detg.  $n$  under different conditions are furnished. E. T. WHERRY.

**The optical properties of magnesium chloroplatinate.** PAUL GAUBERT. *Bull. soc. franc. min.* 40, 177-82 (1917).—Previous work on this substance having led to discordant results, some small crystals were further studied. As ordinarily obtained, this crystallizes with  $7\text{H}_2\text{O}$ , but on polishing a yellow powder with  $6\text{H}_2\text{O}$  is produced; on standing this changed back to the original compd., the new formed material taking up parallel positions on the original crystal. The amt. of  $\text{H}_2\text{O}$ , and accordingly the  $n$ s, vary somewhat with the humidity of the atm. Measurements with the reflectometer gave  $\omega_{[D]^{16^{\circ}}}] = 1.5608$ , and by study in convergent polarized light for D was found to be approx. 1.91. Values for other wave lengths are given. A double cyanoplatinate

of Na and K was also studied, and the lowest  $n$  found to be for D 1.6088 and the highest around 1.90. Similar values had previously been found for the K Li and Rb Li salts.

E. T. WHERRY.

**Stable silver nitrate solution.** F. LIEBERT. *Chem. Weekblad* 16, 74(1919).—By exposing  $\text{AgNO}_3$  soln. to light till all the org. matter has reacted and filtering through asbestos, a stable soln. is obtained. It can be kept in a clear glass bottle in full daylight for more than a year.

JULIAN F. SMITH.

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Metals and alloys from a colloid chemical viewpoint (ALEXANDER) 9.

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CAULLERY, MAURICE: *Les Universites et la vie scientifique aux Etats-Unis*. Paris: Librairie Armand Colin. 302 pp. F4. For review see *Rev. gen. sci.* 30, 121 (1919).

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FINDLAY, ALEXANDER: *Osmotic Pressure*. 2nd Ed. New York, London, Bombay, Calcutta and Madras: Longmans, Green & Co. 116 pp. 6s. net. Cf. *C. A.* 7, 2155.

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### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

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GERALD L. WENDT.

**Radium.** R. B. MOORE. U. S. Bureau of Mines, Golden, Colo. *Bull. Am. Inst. Mining Eng.* 1918, 1672-4; cf. *C. A.* 13, 397.—Discussion of address on radium (*C. A.* 12, 2157). S. C. L.

The aggregate recoil of radioactive substances emitting  $\alpha$ -rays. ROBERT W. LAWSON. Vienna Ra. Inst. *Nature* 102, 464-5(1919).—From his study of the properties of the active deposit of Ra, Ratner has advanced the view (*C. A.* 13, 282) that the spontaneous transference of active matter from the surface of a plate, covered with the active deposit of Ra, to other objects placed near it is due neither to a slight volatility of the active deposit at ordinary temp., nor to radioactive recoil, as suggested by Makower and Russ (*C. A.* 4, 1937), and that the nature of the phenomenon still remains undisclosed. L. now takes exception to this conclusion and makes a preliminary announcement of the results of an investigation which supports the view as advanced by Makower and Russ that the phenomenon in question is due to the recoil of a complex cluster of the atoms of the radioactive matter when one of the atoms contained in it disintegrates with ejection of an  $\alpha$ -particle. It is considered that a transference of active matter by virtue of the recoil resulting from the evolved  $\beta$ -particle is theoretically possible but incapable of practical realization. W. H. ROSS.

**End-product of thorium.** J. R. COTTER. Trinity Coll., Dublin. *Nature* 102, 425(1919).—Thorianite was examd. with a view to the quant. detn. of Tl which had been suggested by Soddy (*C. A.* 11, 2167) as a possible end product of Th. No Tl could be detected in the mineral, and it is claimed that it does not contain as much as even 0.005% of this element.

FREDERICK SODDY. *Ibid* 444.—S. concurs with the result found by Cotter and expresses the opinion that there is now very little exptl. evidence in favor of the view that Tl is an end product of Th. Reference is made to unpublished work that has been carried out at the Ra Inst., Vienna, which indicates that both the isotopes of thorium-Pb are stable.

W. H. ROSS.

**A study of the emanation method of determining thorium.** G. H. CARTLEDGE. Univ. Chicago. *J. Am. Chem. Soc.* 41, 42-50(1919).—The circulation method of detg. Th by means of Th Em has been modified so as to furnish a practical and reliable method for detg. Th quantitatively by means of the emanation electroscope. Instead of a closed cycle for the circulation of the gases, the emanation was pumped through the ionization chamber only once. A special device for the regulation of the pressure in the chamber is described. A method was worked out for preparing radiochemically complete solns. of monazite sand with an accuracy of 1.5%.

S. C. LIND.

**Radioactivity and the coloration of minerals.** E. NEWBERRY AND HARTLEY LUYTON. *Mem. Proc. Manchester Lit. Phil. Soc.* 62, III, 1-16(1917-8).—See *C. A.* 12, 2076.

E. J. C.

**The atomic structure of carborundum determined by X-rays.** C. L. BURDICK AND E. A. OWEN. Sheffield, Alabama. *J. Am. Chem. Soc.* 40, 1749-59(1918).—The internal crystal structure of carborundum has been detd. using the method of crystal reflection of X-rays as employed by Bragg. A target of pure Pb was employed in the generation of X-rays. The results show that the Si and C atoms are each arranged on face centered rhombohedral lattices, very nearly cubic, displaced with respect to one another along the hexagonal axis by 0.36 of the basal plane (111) spacing. The structure is very similar to that of the diamond. From the X-ray crystal measurements the density of carborundum was calcd. to be 3.11 and was found by expt. to be 3.123.

S. C. LIND.

**The absorption of X-rays.** TYCHO E. SON AUREN. Nobel Inst., Stockholm. *Phil. Mag.* 37, 165-207(1919); cf. *C. A.* 12, 1357.—In order to study the relation between at. number and the absorption of X-rays A. has devised a compensation method for detg. the relative absorption coeffs. of X-rays relative to that of water. A large number of elements have been dealt with, most of them in the form of an aq. soln. of a suitable compd., though for the lighter elements which constitute org. substances, the pure liquid org. compds. were preferred. The coeffs. of compds. are comprized additively by the sum of the coeffs. of the component atoms. No difference in coeff. could be observed for the same element in different valences. The state of aggregation also makes no difference in the absorption with the possible exception of C. Nearly all elements from H through Ag and Pb have been detd. for four different wave lengths,  $\lambda = 0.38, 0.36, 0.34,$  and  $0.30 \times 10^{-8}$  cm. Assuming that absorption for H is exclusively due to scattering by the electron combined with the nucleus, scattering for other elements would likely be due solely to the electrons constituting the outer layer. By aid of the relative at. adsorption for H, the number of outer electrons can be estd. for the lighter elements. For different elements the at. absorption increases by groups nearly proportional to the at. number. Assuming that the at. number gives the number of electrons of the nucleus, the distribution of electrons between outer and inner region may be estd. The number of electrons for the lighter elements seems to be the



same for those in the same vertical row of the periodic system, and therefore the distribution of electrons appears to be in close connection with the periodicity of the chemical properties of the elements as expressed by that system. S. C. LIND.

Calculation of scattered radiation from a plate exposed to a beam of X-rays. OSKAR KLEIN, Nobel Inst., Stockholm. *Phil. Mag.* 37, 207-14 (1919).—Mathematical calculation of scattering of X-rays by a solid layer of substance. S. C. L.

Ionization and resonance potentials for electrons in vapors of magnesium and thallium. PAUL D. FOOTE AND FRED L. MOHLER. U. S. Bureau of Standards. *Phil. Mag.* 37, 33-50 (1919).—A continuation of the work of Foote (*C. A.* 12, 2277) to extend to Mg and Tl vapors. The exptl. values for Mg are 2.65 v. for resonance potential and 7.75 v. for ionization potential. The corresponding values calcd. from the quantum relation are 2.70 and 7.61 v., resp. For Tl the observed values are 1.07 and 7.3 v.; the theoretical value for the resonance potential of Tl vapor is 1.07, the theoretical value for ionization potential being unknown. The ionization potential of Mg is detd. by the limit of the series  $1.5 S-m\phi$  and the resonance potential by the first line in the series  $m = 2$ . For Tl the resonance potential is detd. by the shorter wave length member of the first term of the principal series of doublets. No known series for Tl has a convergence frequency greater than 49263. The observed ionization potential for Tl suggests an undiscovered series of single lines converging at  $\nu = 1.5 S = 57000$  to 60000. Evidence is furnished that the single-line spectra of Mg and Tl are  $\lambda = 4751$ , and  $11513 \text{ \AA}$  units, resp. The general behavior of metals in the same group of the periodic table appears to be identical as regards ionization and resonance potentials. From a large number of expts. on 7 different metals the writers give a mean value of Planck's const. of  $h = 6.55 \cdot 10^{-27}$  erg. sec. S. C. LIND.

The light from mercury vapor. C. D. CHILD. Colgate Univ. *Phil. Mag.* 37, 61-4 (1919).—A discussion of Strutt's (*C. A.* 12, 1359) recent conclusion that the luminosity produced in passing elec. discharge through vapors at low pressures is due to negative electrons. C. had earlier concluded (*C. A.* 8, 2522) that the light is due to the recombination of positive and negative ions. C. holds that the matter is not necessarily decided by Strutt's expts. and that further observations are required to settle it definitely. S. C. L.

Radium and uranium in 1916 (Hess) 9. A tyndallmeter for the examination of disperse systems (TOLMAN, VLIET) 2. Examination of metals by X-rays (PILON) 9. The assignment of crystals to symmetry classes (TUTTON), (WHERRY) 2. Polar and non-polar valency (DE) 2.

Radium from carnotite ore. H. N. MCCOY. U. S. 1,292,341, Jan. 21. Ore containing 10% carnotite and 90% of sand and earthy materials is ground and treated with about 50% its weight of  $H_2SO_4$  of about 60% strength. The mixt. is dried at a temp. of  $100^\circ$  until the  $H_2O$  has been largely driven off and is then baked at  $250^\circ$ . The product is a green solid containing sulfates of the metals present such as V, U, Al, Fe, Mg, Ca, Ba and Ra. This green solid is stirred with  $H_2O$ , decanted and the decanted soln. is filtered. The material is thus sepd. into 3 portions: (a) a green soln. principally composed of sulfates of V, U, Al, Fe and Mg; (b) a residual coarse sand without value; and (c) a fine slime made up of the sulfates of Ca, Ba and Ra together with siliceous materials. One ton of the ore yields about 400-600 lbs. of this Ra-bearing slime. A portion of this slime concentrate, having a dried weight of 220 lbs., is wetted with 200 lbs. of  $H_2O$  and mixed with 900 lbs. of a 30% aq. soln. of HF to furnish a sufficient proportion of HF to combine with the silica present and with 20 lbs. of concd.  $H_2SO_4$  and the mass is stirred for 3-8 hrs. to complete the reaction. The undissolved

residue, having a dry weight of usually about 20 lbs., contains practically all the Ra, together with sulfates of Ca and Ba. This residue is then further concd. and purified as may be desired by any suitable method.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

Output of the largest generating systems. ANON. *Elec. World* 73, 632-3(1919).—Data on output and load factor of 46 companies in U. S. and Canada. Among the electrochemically important: Niagara Falls Power Co., 2 billion kw. hr. yearly output at 92.2% yearly load factor; Ontario Power Co., 1,600,000,000 kw. hr., 81.9%; Toronto Power Co., 900,000,000 kw. hr., 81.9%.  
C. G. F.

The electrometallurgical industries of Scandinavia. KNUDSEN. *J. four Elec.* 28, 17-8(1919).—Sweden: The present production of elec. furnace Fe is 100,000 tons per year (67,057 in 1917 and 44,737 in 1916). Elec. furnace Fe is  $\frac{1}{8}$  the total production of Swedish Fe and this percentage will be increased by new installation at Trollhättan and Porjus. New furnaces will increase the production of elec. steel over the 10,664 tons from 25 furnaces in 1917. The production of ferro-alloys showed a loss for 1918. Norway: War-time production of  $\text{NH}_4\text{NO}_3$  has turned to  $\text{Ca}(\text{NO}_3)_2$  for fertilizer. Carbide manuf. is naturally changing to cyanamide; a plant has been built for converting carbide to EtOH by the Utheim process. The exportation of ferro-alloys decreased in 1918 while elec. furnace production of Fe and steel did not increase even with the scarcity and high price of Fe during the war.  
LOUIS JORDAN.

A technical description of industrial electric furnaces. JEAN ESCARD. *Rev. gén. Elec.* 4, 575-91(1918); illus.—A description of the general types of arc, resistance, and induction furnaces together with several types of special applications; viz., a furnace for the production of powdered metals, a furnace operating under high pressure (2,000-2,500 kg. per sq. cm.) equally adapted for vacuum work, furnaces heated by the resistance of fused salts, and a C block furnace. Installation, refractory linings, and methods of connecting with d. c. and single and polyphase a. c. current supply are considered.  
LOUIS JORDAN.

Temperature uniformity in an electric furnace. JOHN B. FERGUSON. *Chem. Met. Eng.* 20, 283-8(1919).—See C. A. 13, 536.  
E. J. C.

Electric steel. J. ESCARD. *Rev. gén. sci.* 29, 366-73, 401-13(1918).—A general discussion is given of the whole subject. The article is liberally illustrated with photographs and diagrams. The pig iron Héroult furnaces at Sault St. Marie, and the Keller blast furnace at Trollhättan (Sweden) are described. The following steel furnaces are discussed in detail: the Héroult Bessemer, the Stassano, Rennerfelt, Girod, Keller, Chaplet, Nathusius, Hiorth, and the Röchling-Rodenhauser.  
C. H. ELDRIDGE.

The electric furnace and its application in the manufacture of industrial products. J. ESCARD. *L'industrie chimique* 5, 214-8, 253-5, 284-6, 315-7(1918); 6, 8-12(1919).—A detailed illustrated review covering the elec. production of H, P, As, Si, B, graphite, Ba salts, BeO, fused  $\text{SiO}_2$ , ZnO, ferrites of Na, Ca, Sr and Ba, glass, cements, ZnS,  $\text{CCl}_4$ ,  $\text{S}_2\text{Cl}_2$ , and  $\text{CS}_2$ . Cf. following abstract.  
C. G. F.

The preparation in the electric furnace of some metals of industrial application. JEAN ESCARD. *Rev. gén. Elec.* 4, 375-86(1918).—A comprehensive discussion of the various methods of prepn. (with many working details) of the metals and alloys of Ba, Ca, Be, Co, Ni, Ti, Mn, Cr, Mo, W and V, with data on their chem. and physical

properties and uses. Some Ca-Al alloys (prepd. by electrolysis of  $\text{CaCl}_2$  in the presence of Al) are harder than Al; Ca-Al alloy is of value in removing gases ( $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ ) from molten metals. Co in special steels gives remarkable properties and Co-Cr alloys are hard and resistant to corrosion and oxidation at high temp. The ternary alloy, Cr-Cu-Ni, is very resistant to acids. W in artillery projectiles increases the penetration of the shell. W-Mo thermocouples are used for temperature, above the range of Pt-Pt Rh couples (*C. A.* 7, 734, 1330). W tubes and crucibles for elec. furnaces withstand very high temp., comparable only to C, and possess advantages over C because of the low sp. heat of W and the absence of the carburizing of metals under treatment. Cf. preceding abstr. LOUIS JORDAN.

**Manufacture of ferro-alloys in the electric furnace.** R. M. KEENEY. *Bull. Am. Inst. Mining Eng.* 1918, 1651-4.—A discussion (cf. *C. A.* 12, 2164). E. S. BARDWELL states that in production of Fe-Mn almost nil volatilization losses of Mn take place in small (1500 k. v. a.) low volt (65 v.) furnaces, and that slag losses are much lower than in large furnace of 3000 k. v. a. and 100 volts. High voltage gives irregular working, overheating in spots (high volatilization losses), accompanied by cooler areas which cause the partially reduced Mn to pass into the slag. Substitution of coke for coal will reduce resistance and with low voltage will bring about steadier operating conditions than obtain in high voltage furnaces. Slags containing only 3% of total Mn in the ore have been obtained in small, low-voltage furnaces. A thorough study of furnace conditions should reduce losses in high-voltage large furnaces. Mr. H. W. GILLET questions Mr. Keeney's figures that C in ferro-U must be over 3.5% to hold large amts. of U. Gillett, by using excess of  $\text{UO}_2$  over C in the charge has produced ferro-U containing 50-70% U and with C below 2%. C. H. ELDRIDGE.

**Uses electric furnace in malleable foundry.** F. L. PRENTISS. *Iron Age* 103, 537-43 (1919).—The Kranz Triplex Process is used in the foundry of the Nat'l Malleable Castings Co., of Cleveland. An extended description is given of the equipment and floor plans of this foundry. The triplex process is designed to overcome the difficulties resulting from the presence of relatively high C, Mn and Si in the Fe. Two tons of metal tapped from the cupola is refined in a Bessemer furnace, and then added to 10 tons of cupola Fe to reduce the impurities in it. The resultant mixt. is charged into the elec. furnace for final refinement. Two 15-ton Héroult furnaces are used for its last refining. The process for casting steel anchor chain is described. The chain is heat-treated in two Bailly elec. furnaces. Cf. following abstr. W. E. RUDER.

**Electric furnaces of the resistance type used in the production of essential war materials.** T. F. BAILY. Alliance, Ohio. *Trans. Am. Electrochem. Soc.* 35, preprint (1919).—The resistance elements consist of carborundum fire sand troughs, set on fire brick piers within the furnace chamber proper, and filled with broken C. The elec. current is led into the resistor at the end of each trough by means of C or graphite electrodes. The three 900-kw. heat-treating sets for heat treatment of cast steel chain for the Emergency Fleet Corporation are described at full length. Each equipment consists of one 600-kw. furnace for heating the anchor chain for hardening, a 300-kw. furnace of the same general dimensions for the drawing operation, and a concrete water pit for quenching, as well as a motor-driven winch in front of each furnace for handling the chains into, through and out of that furnace. Each furnace is 8.5 m. long by 5.0 m. wide. The entire length of the equipment is 40 m. The transformer equipment for supplying electricity to the furnaces consists of three 300-kw. 60-cycle, single-phase transformers with their high-tension side wound for 11,000 volts. C. G. F.

**Saving the waste with an electric furnace.** C. B. MERRICK. *J. Elec.* 42, 30 (1919).—A two-phase Rennerfelt furnace of 750 lbs. capacity installed in a foundry has

been found useful for recovering scrap metals which could not be used in a cupola and in producing small batches of castings of special quality. W. E. RUDER.

**Electric smelting on the Pacific Coast.** W. L. MORRISON. *J. Elec.* 42, 67(1919).—The possibility of making ferro-alloys in the Northwest is cited. As now applied, 25 to 100 kw. single-phase furnaces or pots are used almost universally. These pots vary from 10 in. inside diam. to 24 in. and from 24 to 36 in. in height. When filled with alloy they are broken open. The electrodes are made at the home plant. The smelting of silico-manganese is successfully carried out. W. E. RUDER.

**Melting brass in a rocking electric furnace.** H. W. GILLETT AND A. E. RHOADS. *Bur. Mines, Bull.* 171, 126 pp.(1918).—The general problem of elec. brass furnaces is discussed with the advantages and limitations of various types of furnaces that have been commercially tested; *vis.*, Helberger, Hoskins, Baily, General Electric, Snyder, Rennerfelt, Bennett, Hering, Ajax-Wyatt, Foley, and Northrup. The construction of an indirect arc rocking furnace (cf. *C. A.* 12, 1728) is described and details of exptl. heats for both lab. and com. size furnaces are given. Metals charged included red and yellow brass, Mn-bronze, Ni-brass, and Cu-castings; all were melted with low metal loss. LOUIS JORDAN.

**Electric arcs.** J. C. MACGREGOR-MORRIS. *Engineering* 107, 214(1919).—A detailed account of two lectures delivered at the East London College. The author points out that a great deal of useful work has been done recently on arcs, but that a great deal remains to be done. C. H. ELDRIDGE.

**Electrostatic precipitation.** O. H. ESCHOLZ. *Bull. Am. Inst. Mining Eng.* 1918, 1654, 1775.—A discussion of a paper abstracted in *C. A.* 12, 2166.

H. JERMAIN CREIGHTON.

**Electric precipitation of fumes.** F. MICHEL. *Rev. gén. sci.* 29, 456-68(1918).—A complete discussion of the Cottrell system. History and theory are given, and some typical installations are described. C. H. ELDRIDGE.

**The Cottrell electrostatic recovery process of flue dust and fumes.** H. J. BUSH. *J. Soc. Chem. Ind.* 37, 389-91R(1918).—A review of the development of the Cottrell process and a short description of a number of plants. H. JERMAIN CREIGHTON.

**Electric precipitators.** E. E. THUM. *Chem. Met. Eng.* 20, 59-64(1919).—A summary of observations taken from plants where the Cottrell process is installed. The sphere of usefulness of the process, the power equipment, the current characteristics, the advisability of interrupting the gas current during shaking, electrodes and insulators, the replacement of punctured insulators, gas distribution, and the effect of temp. variations are discussed. If differential pptn. is to be attempted, close temp. control will be necessary, and in this case the treater pipes may be surrounded with adjustable louvers so that cold air may be admitted or excluded. The efficiency of the pptn. of fume-laden gases may be increased by water sprays discharging into the flue leading to the pptg. plant. H. JERMAIN CREIGHTON.

**Notes on electrostatic precipitation.** H. D. BRALEY. *Trans. Am. Electrochem. Soc.* 35, preprint(1919).—A review of the general question of electrostatic pptn. of dust and fume, including the removal of emulsified  $H_2O$  from oil. The following applications are discussed: recovery of metallic dust from gas fumes given off from ore smelters, roasters and blast furnaces, the most important of which are the Pb and Cu recoveries; recovery of Sb, S and As from Cu and Pb-bearing ores; recovery of potash from cement dust in cement mills treating potash-bearing limestone. Detailed data are given for the cost of different plants, operating costs, values recovered and profits secured. Gas treaters of the tube and the plate type and of the plate type employing  $H_2O$  film, as well as liquid treaters employing stationary electrodes and rotating elec-

trodes are discussed; also temp. control, the gas velocity in the treaters, the direction of the gas flow, the capacity of the elec. equipment, the operating voltage, and the elec. app. are discussed.

H. JERMAIN CREIGHTON.

**Aluminium-manufacturing processes used in Europe.** O. NISSEN. *Chem. Met. Eng.* 19, 804-15(1918).—An historical review of the com. developments and researches. The various bauxites and processes employed for the prepn. of pure alumina, as well as the methods of manufacturing C electrodes, are described. The elec. installation, the industrial applications of Al, and the world's production of bauxite are discussed. The cost in francs of Al per kg. is estd. on pre-war conditions as follows: 35 kw.-hrs., 0.25; 2 kg. alumina, 0.50; 0.8 kg. electrodes, 0.28; 0.12 kg. cryolite, 0.05; 0.05 kg. fluorine, 0.03; 0.25 working hours, 0.15; miscellaneous, 0.15, making a total of 1.41 francs. The paper is illustrated with numerous diagrams of furnaces, including one of the Serpek AlN furnace.

H. JERMAIN CREIGHTON.

**Electrolytic zinc.** C. A. HANSEN. *Bull. Am. Inst. Min. Eng.* 1918, 1639-41; cf. *C. A.* 12, 652.—Additional data are given upon the effect of temp. upon the behavior of Zn cells. Current efficiencies obtained indicate a doubling of the corrosion rate with each 21.7° rise in electrolyte temp. Parallel tests made by merely suspending sheets in solns. at different temps. (not cathode) indicate no definite temp. coeff. In the temp. range 40-45°, evapn. of soln. from electrolyte surface accounted for 87% of the energy dissipated at the surface. The fundamental necessity of pure electrolyte is emphasized.

W. E. RUDER.

**Electrolytic production of antimony directly from stibnite ore.** D. J. DEMOREST. *J. Am. Inst. Metals* 11, 83(1917).—Stibnite is dissolved in NaOH or Na<sub>2</sub>S and Sb is deposited from this soln. in a high state of purity with a current efficiency of 76% and a voltage of 2.7. This makes the power cost about equal to that of electrolytic Zn production. After melting, the Sb was found to be very pure, containing only 0.02% S and 0.01% As, no Pb and a trace of Fe. A 5000-amp. plant was successfully experimented with. The soln. must be regenerated or renewed when one lb. of Sb is produced per lb. of NaOH used.

W. E. RUDER.

**A permanganate electric cell.** ARTHUR W. WARRINGTON. *Chem. News* 117, 97-8(1918).—HMnO<sub>4</sub> is a stronger oxidizing agent than chromic acid. Hence a cell with the former as depolarizer should be more active than one with the latter. Since ions will be relatively more plentiful in a dil. soln. than in a strong one, there is no adequate reason for using strong solns. Zn-C cells with 3.16 g. KMnO<sub>4</sub> + 6 cc. concd. H<sub>2</sub>SO<sub>4</sub> in a vol. of 250 cc. in the C-compartment and 14.55 g. crystd. ZnSO<sub>4</sub> in a vol. of 700 cc. in the Zn-compartment, gave a much better yield of elec. current than dichromate cells with which they were compared. The yield of current in a KMnO<sub>4</sub>-cell becomes very high when the solns. used are very dil.

LOUIS JORDAN.

**War-time development of vacuum tubes.** R. BROWN. *Elec. World* 73, 358-63 (1919).—The Signal Corps work in standardizing the various types of vacuum tubes for wireless transmission and receiving are described and curves of their characteristics given. The De Forest, General Electric and Western Electric types were used extensively. The design of tubes is to-day in advance of their practical application. The possibility of economically manufacturing tubes of desired characteristics in large quantities has been demonstrated.

W. E. RUDER.

**The development of the vacuum valve.** ANON. *J. Elec.* 42, 20-2(1919).—The method of manuf. of the Moorehead type of vacuum tube detector is briefly described. Photographs of some of the operations are given.

W. E. RUDER.

**The manufacture of vacuum detectors.** O. B. MOORHEAD. *Electrician* 87, 741

(1918).—A short description of the methods employed in assembling, exhausting and testing this type of wireless detector. W. E. RUDER.

Note on the effect of temperature on the resistances of spark plug insulations. J. D. MORGAN. *Engineering* 106, 513(1918).—Thirteen spark plugs from different makers were tested on heating to 500° in a small muffle and varying rates of sparking. Curves of results are given. Insulation leakage due solely to temp. is not so serious as the temp.-resistance curves indicate. Leakages at high temps. in some plugs was found to be excessive. At 400° the plugs varied in resistance from  $10^6$  to  $70 \times 10^6$  ohms. W. E. RUDER.

Transformer for welding battery connections. ANON. *Elec. World* 73, 608 (1919).—In order to afford convenient means for burning or welding straps and posts on storage batteries a small lead-burning transformer has been developed, designed on the arc-welding principle. It is to be connected directly to the 60-cycle 110-volt lighting circuit. When in operation the energy consumption is from 500 to 600 watts. Wt. of transformer is 25 lbs. C. G. F.

The testing of switch and transformer oils. C. SCHNEDELL. *Electrotechn. Z.* 25, (1918); *Electrician* 82, 125(1919).—In transformers, either resinous or mineral oils may be used. The resinous oils are better insulators and deposit very little material after long heating, but are slightly more volatile than mineral oils. They are unsuitable for switches, however, as they carbonize badly in the arc, leading to the possibility of explosions in oil switches. The oil must be free from cloudiness, straw, fiber, or sand. The  $d_{44}$  should be between 0.85 and 0.92 for transformers and 0.88–0.9 for switches. The flash-point should not be under 160° for transformers and 170° for switches. The Marcusson app. is recommended for this test. The test for the deposition of solid material by long heating is important and is described at length. The acidity and S tests are also described fully. W. E. RUDER.

Compact oil-testing cup. ANON. *Elec. World* 73, 348(1919).—A molded cup containing two brass electrode brushings is used for the test. Binding posts are attached to the accurately fitting electrodes which, by means of a steel feeder gage, can be set at exactly 0.1 in. (0.25 cm.). A 4-oz. sample of oil is tested for dielec. strength. The max. voltage required for reliable testing is given as 25,000 v. The whole cup weighs  $6\frac{1}{2}$  lbs. (2.9 kg.) and is  $21.6 \times 10 \times 12$  cm. overall. W. E. RUDER.

Certain characteristics of porcelain (BLEININGER) 19. Production of nitrogen compounds (MONTGOMERY) 18. Photometer liquids in tablet form (HAUSMANN) 1. Electric heating in concentration of sulfuric acid (PAGLIANI) 18. Valuation of natural and artificial bitumens for insulating cables (DUPRÉ) 22. The velocity of oxidation of nitric oxide (BRINER) 6. Photographic study of porcelain insulators (TUFTY) 19.

Storage battery. H. C. BUSCH. U. S. 1,292,247, Jan. 21. Structural features.

Electrolytic cell. E. E. NISWONGER and P. McDORMAN. U. S. 1,292,024, Jan. 21. The cell is adapted for producing relatively small amts. of NaOCl for use as an antiseptic in hospitals and is adapted to operate efficiently on less than 25 amps. of current under usual voltages. The cell is formed of hard rubber with electrodes of graphite.

Electric dry cell battery. N. K. CHANEY. U. S. 1,292,254, Jan. 21. In forming a mixt. for use in dry cells, C is employed which is free from ferrous sulfides. The exclusion of the latter serves to decrease corrosion of the Zn during the "shelf life" of the battery.

**Dry cell electric battery.** C. HAMBURCHEN. U. S. 1,292,764, Jan. 28. Dry cells are formed with a gelatinous electrolyte containing  $\text{NH}_4\text{Cl}$  450 g. to each 1000 cc. of 32%  $\text{ZnCl}_2$  soln.

**Electroplating apparatus.** J. GIULIANA. U. S. 1,291,830, Jan. 21.

**Alkali metal permanganates.** T. J. BREWSTER. U. S. 1,291,751, Jan. 21.  $\text{KCl}$  10 is dissolved in  $\text{H}_2\text{O}$  30 parts and if Ca compds. are present they are removed by pptn. with  $\text{K}_2\text{CO}_3$ . This soln. is then electrolyzed to produce  $\text{Cl}$ ,  $\text{KOH}$  and  $\text{H}$ . The  $\text{KOH}$  soln. drawn off from the electrolytic cell may be composed of  $\text{KOH}$  6,  $\text{KCl}$  2 and  $\text{H}_2\text{O}$  30 parts. This soln. may then be evapd. until it contains only 6 parts of  $\text{H}_2\text{O}$ , to effect the crystn. of the  $\text{KCl}$ , which is returned to the electrolytic cell. The strong  $\text{KOH}$  soln. obtained is mixed with 9 parts of finely ground oxides of  $\text{Mn}$  for each 6 parts  $\text{KOH}$  in the soln. and this mixt. is then heated in the air for 1-4 hrs. at a temp. of  $360-450^\circ$  to effect formation of  $\text{K}_2\text{MnO}_4$ . The calcined product is cooled, treated with  $\text{H}_2\text{O}$  and the soln. is then treated with  $\text{Cl}$  in excess to produce  $\text{KMnO}_4$  and  $\text{KClO}_3$ , which may then be sepd. from each other and from  $\text{KCl}$  in the soln. by fractional crystn. If it is desired to avoid the formation of chlorate, a restricted amt. of  $\text{Cl}$  is passed into a soln. containing  $\text{K}_2\text{MnO}_4$  and  $\text{KOH}$  to form hypochlorite and permanganate and there is then added to the soln. containing these products sufficient  $\text{HCl}$  to effect neutralization and conversion of unoxidized manganate into permanganate without formation of chlorate.  $\text{NaCl}$  may be similarly employed as a starting material, with formation of  $\text{NaMnO}_4$ . If desired  $\text{KOH}$  may be used as the starting material instead of  $\text{KCl}$  and a 5-10% soln. of the  $\text{K}_2\text{MnO}_4$  produced is boiled to produce  $\text{KMnO}_4$  and regenerate a portion of the  $\text{KOH}$ . The  $\text{K}_2\text{MnO}_4$  may also be oxidized to  $\text{KMnO}_4$  electrolytically, using a graphite anode and  $\text{Fe}$  cathode and a low current d. at the anode.

**Calcium carbide.** F. M. BECKET. U. S. 1,292,386, Jan. 21. Aggregates for use in the elec. furnace in the manuf. of  $\text{CaC}_2$  are prepd. from lime 100 and bituminous coal 100-110 parts, preferably using coal containing 30-36% volatile matter. The aggregate may be produced by burning lime and coking coal together in an inclined rotary tubular furnace, the temp. at the discharge end of which may be about  $1000^\circ$ .

**Calcium carbide.** F. M. BECKET. U. S. 1,292,387, Jan. 21. Aggregates for use in the manuf. of  $\text{CaC}_2$  are prepd. by heating a mixt. of limestone with about 62% its weight of a rich bituminous coal, first to a coking temp. and then to a lime-burning temp. The heating may be carried out as a continuous operation by passing the material on a conveyor or by other suitable arrangement through a furnace which is heated near its exit end to about  $1100^\circ$ .

**Calcium cyanamide.** G. E. COX. U. S. 1,292,715, Jan. 28. In the formation of  $\text{CaCN}_2$  from  $\text{CaC}_2$  by the action of  $\text{N}$ , a slab of kieselguhr or other heat-insulating material is placed over the top of the charge during the conversion, to prevent loss of heat from the top and promote uniformity of the nitrification throughout the mass of  $\text{CaC}_2$ .

**Apparatus for effecting gas reactions and electrical precipitation of solid reaction products.** L. BRADLEY. U. S. 1,291,745, Jan. 21. The app. is arranged for the circulation of reaction gases (such as smelter gases containing  $\text{SO}_2$ ) in a closed cycle. At one point in the cycle a reagent such as  $\text{NH}_3$  is introduced to produce a non-gaseous reaction product such as  $\text{NH}_4\text{HSO}_4$  and the reaction product is then removed and collected by elec. pptn.

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

The syn-crystallization of potassium and ammonium nitrate at ordinary temperatures. CAILLART. *Bull. soc. franc. min.* 41, 21-30(1918).—The formation of mix-crystals of these salts has been studied in fusions, but C. has now detd. the equil. relations in aqueous solns. By varying the relative amts. in the solns. mixed crystals with the form of  $\text{KNO}_3$  and again with that of  $\text{NH}_4\text{NO}_3$  were obtained.

E. T. WHERRY.

A contribution to the chemistry of tellurium sulfide. AARON M. HAGEMAN. *J. Am. Chem. Soc.* 41, 329-41(1919).—The introduction of  $\text{H}_2\text{S}$  into an aq. tetravalent Te soln. at room temp. ppts. a red-brown compd. represented by the formula  $\text{TeS}_2$ . Its production is independent of the acid concn. Below  $-20^\circ$   $\text{TeS}_2$  is stable, but above  $-20^\circ$  it dissociates, the dissociation being more rapid the higher the temp. The degree of dissociation at any one time or temp. can be detd. by the amt. of S which can be extd. by  $\text{CS}_2$ . Dissociation never continues to completion. The dissociated mass extd. with  $\text{CS}_2$  always retains at least 0.95% S. This S does not exist as a sulfide of Te that is decompd. by  $\text{HCl}$  or  $\text{HBr}$ , nor as a variety of S that is insol. in  $\text{CS}_2$ .  $\text{TeS}$  does not exist.  $\text{TeS}_2$  is pptd. by  $\text{H}_2\text{S}$  from org. solvents exactly as from aq. solns. Its stability is solely a question of temp.

R. H. LOMBARD.

The preparation of selenic acid. H. H. MORRIS. *Trans. Wis. Acad. Sci. Arts and Letters* 19, 369-73(1918).—M. recommends the method of Thomsen (*Ber.* 2, 598 (1869)), but suggests precautions necessary for obtaining a stable prepn. Carefully purified  $\text{SeO}_2$  is converted into  $\text{Ag}_2\text{SeO}_3$ , which is treated in aq. soln. with pure Br (free from reducing substances). The filtrate from the  $\text{AgBr}$  is concd. under reduced pressure to remove excess Br and  $\text{H}_2\text{O}$  in an all-glass app. The concd. acid is treated with well washed  $\text{H}_2\text{S}$  to remove  $\text{H}_2\text{SeO}_3$ . The ppt. of S and Se is removed by filtering through asbestos. Great care must be taken to exclude dust throughout the prepn.

A. L. BARKER.

Some properties of magnesium ammonium phosphate and magnesium pyrophosphate. Z. KARAOGLANOW AND P. DIMITROW. *Z. anal. Chem.* 57, 353-71(1918); *J. Soc. Chem. Ind.* 38, 40A.—The conversion of  $\text{MgNH}_4\text{PO}_4$  into  $\text{Mg}_2\text{P}_2\text{O}_7$  may or may not be accompanied by incandescence, depending upon the conditions under which the  $\text{MgNH}_4\text{PO}_4$  is pptd. The product will not incandesce if pptd. slowly at the boil, but will do so if formed quickly or at lower temps. It has been found that incandescence never takes place if all traces of org. matter are carefully excluded from the ppt. The properties of  $\text{Mg}_2\text{P}_2\text{O}_7$  depend upon whether it is formed with or without incandescence. If incandescence occurs, the product is hard and lava-like and gray to black in color, while if there is no incandescence, it is amorphous, loose in texture, and quite white.

E. J. C.

Formation of iron disulfide by a wet method. V. ROBR. *Mitt. kgl. Materialprüfungsamt.* 36, 93-107(1918); *J. Soc. Chem. Ind.* 37, 732A.—The  $\text{FeS}_2$  formed as the first product of the interaction of  $\text{H}_2\text{S}$  and iron hydroxide readily becomes partially insol. in  $\text{HCl}$ , as for example, when the reaction is carried out at a higher temp. The insol. substance has the compn.  $\text{FeS}_2$ ,  $d_4^{25}$  4.58, and is formed in accordance with the equation  $\text{Fe}_2\text{S}_3 \rightarrow \text{FeS}_2 + \text{FeS}$ . It may also be produced by the addition of S to  $\text{FeS}$ , in the absence of substances with an alk. reaction, which also interfere with its formation from  $\text{Fe}_2\text{S}_3$ . It is probably formed in this way in soils contg. iron hydroxide and putrescent matter, but free from alk.-earth carbonates. By boiling solns. of Fe with alkali polysulfides it may be found possible to sep. Fe quantitatively in the form of  $\text{FeS}_2$ .

E. J. C.



**Recovery of molybdenum as ammonium molybdate from residues.** S. MALOWAN. *Chem. Ztg.* 42, 410(1918); *J. Soc. Chem. Ind.* 37, 673A.—To recover molybdic acid used as a precipitant in P detns., ppt. the liquors with Na or Ca phosphate; after washing and drying the yellow ppt., heat with excess of strong  $\text{H}_2\text{SO}_4$  until soln. is complete, and the acid colorless. Pour the cold liquid into 8–10 times its vol. of water and ppt. the Mo with excess of  $\text{K}_4\text{Fe}(\text{CN})_6$ . Filter off the ppt. after 3 hrs. and wash with dil. ferrocyanide soln. till free from  $\text{H}_2\text{SO}_4$ ; then dry it, sep. from the filter, and ignite at a dark red heat to incipient fusion. Leach the cold mass twice with hot water, after which ext. the molybdic acid with  $\text{NH}_3$ . Filter the colorless soln. and evap. to dryness. Treat with a little water and  $\text{H}_2\text{O}_2$  and boil the soln. to oxidize any lower oxides. Dil. the resulting soln. of  $\text{NH}_4$  molybdate to a sp. gr. of 1.09 at  $17^\circ$  (i. e., 10%).

E. J. C.

**Studies on sulfites, thiosulfates, and polythionates.** A. SANDER. *Z. angew. Chem.* 31, I, 197(1918); *J. Soc. Chem. Ind.* 37, 731A.—In connection with his work on the quant. detn. of sulfites, thiosulfates, and polythionates (*C. A.* 9, 279, 2042; 10, 866, 1140), S. has studied the action of these substances on  $\text{HgCl}_2$ . By the interaction of  $\text{HgCl}_2$  with alkali thiosulfates and polythionates, very unstable Hg thiosulfates and polythionates are formed, which immediately break down into  $\text{HgS}$  and free  $\text{H}_2\text{SO}_4$  (together with free S in the case of tetra- or pentathionates). Alkali sulfites and bisulfites, on the other hand, form with  $\text{HgCl}_2$  stable complex compds., salts of the disulfonic acid,  $\text{Hg}(\text{SO}_3\text{H})_2$ , and of the chlorosulfonic acid,  $\text{HgClSO}_3\text{H}$ . The quant. analytical processes worked out by S. depend upon this difference in behavior towards  $\text{HgCl}_2$ .

E. J. C.

**The velocity of oxidation of nitric oxide in reference to the industrial problem of the oxidation ("recuperation") of the oxides of nitrogen.** E. BRINER. *Arch. sci.* 46, Supplement, 23–5(1918); *Sci. Abstracts* 21A, 398(1918).—B. has studied the conditions affecting the oxidation of NO, formed in the arc discharge through air. In excess of O, the reaction is bimol., the velocity coeff. at  $21.5^\circ$  being about 0.051. With change of temp., this will vary according to the conditions of heat radiation; under the particular conditions of B.'s expts., lowering the temp. by  $10^\circ$  between  $6^\circ$  and  $50^\circ$  increased the oxidation by 10–20%, due probably to the fact that lowering the temp. favors the production of  $\text{N}_2\text{O}_4$  and  $\text{N}_2\text{O}_3$  mols.

R. E. HALL.

**An unusual sulfur crystal (BICHOWSKY) 8. Optical properties of magnesium chloroplatinate (GAUBERT) 2.**

SESTER, GEO.: *A Text-Book of Inorganic Chemistry*. 4th Ed. New York: D. Van Nostrand Co. 631 pp. 33. Cf. *C. A.* 6, 2584.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**Notes on chemical standards and their bearing on the unification of analysis.** C. H. RIDSDALE AND N. D. RIDSDALE. *J. Soc. Chem. Ind.* 38, 15–267(1919).—A review and discussion of the subject in general, together with views based on the authors' experience in the prepn. and issue of private standards (5 basic and 5 acid steels, 1 cast Fe, and 1 hematite). Tables are given showing (1) the relative accuracy of analytical methods as indicated by the extremes of variation obtained between a no. of chemists (using normal care) on standardized steels; (2) final results after investigation, representing work with extreme care. Analytical methods with recom-

recommendations and precautions are given in an appendix. At the present time, the Iron and Steel Inst. has in progress the prepn. of analytical steel standards. Cf. Hillebrand, *C. A.* 11, 426.

F. W. SMITHER.

Calculation of the error made in volumetric analysis. V. ZOTTER. *Bull. sci. pharmacol.* 25, 357-64(1918).—Continuation of an earlier paper. Cf. *C. A.* 13, 403.

F. S. HAMMETT.

Errors in alkalimetry due to the carbon dioxide content of distilled water. G. BRUHNS. *Z. anal. Chem.* 57, 257-77(1918); *J. Soc. Chem. Ind.* 37, 750A.—Distd. water absorbs  $\text{CO}_2$  from the atin. and this dissolved  $\text{CO}_2$  has a marked influence on the results obtained in alkalimetric titrations if such water is used for the prepn. of the standard solns. The standard acid and alkali solns. themselves absorb  $\text{CO}_2$ .

E. J. C.

A titration formula. F. K. STEPHAN. Amsterdam. *Chem. Weekblad* 16, 44-6 (1919).—Volumetric calcns. can be simplified by the use of the formula:  $NVE = P$ , where  $N$  is the normality of the soln.,  $V$  is the number of l. taken as a standard,  $P$  is the wt. in g. of the dissolved substance, and  $E$  is 1 g.-equiv. of the same.

JULIAN F. SMITH.

Arsenious acid as a standard substance in iodometry. ROBERT M. CHAPIN. *J. Am. Chem. Soc.* 41, 351-8(1919).—The work indicates that arsenious acid properly prepared is a very satisfactory standard material in iodometry. L. J. ROGERS.

Zinc dust for analysis. O. BINDER. *Chem. Zig.* 42, 458(1918); *J. Soc. Chem. Ind.* 37, 718A.—B. has found that Zn dust contains appreciable amts. of Cl, for which allowance must be made in certain analytical processes.

E. J. C.

Utilization of waste paper in filtration. S. L. JODIDI AND H. G. HIGGINS. *Chem. Eng.* 27, 45-60(1919); cf. *C. A.* 10, 730, 1146, 1620, 1970.—The authors report in detail a series of expts. on the detn. of Ca, Mg, Ag and  $\text{P}_2\text{O}_5$ , using pulp filters made of S. and S. No. 588 paper filters, and (treated and untreated) "Westowl" paper towels, "Scottissue" paper towels, blotting paper, used newspaper, and used writing paper. Those kinds of paper which pulp readily can ordinarily be used in pulp form for filtration purposes. The various pulp filters described are not recommended in preference to pulp filters made from quantitative filters, but are recommended whenever standard filter paper is not available, especially for technical and com. work.

F. W. SMITHER.

Bibliography on the analysis of antimony. I. ELTON R. DARLING. *Chem. Eng.* 27, 11-2, 21, 63(1919).

E. H.

Determination of antimony in white metal. E. W. KAISER. *Metall* 1917, 320-1; *Z. angew. Chem.* 31, II, 230(1918); *J. Soc. Chem. Ind.* 37, 627A.—One g. of drillings is dissolved in 20 cc. of concd.  $\text{H}_2\text{SO}_4$ , cooled, and dild. with 50 cc. of water. Fifteen cc. of concd. HCl is added and the soln. boiled till all odor of Cl has disappeared. 100 cc. of water is added when cold and 15 cc. of a soln. contg. per l. 67 g. of  $\text{MnSO}_4$ , 135 cc. of  $\text{H}_3\text{PO}_4$  (sp. gr. 1.7), and 130 cc. of concd.  $\text{H}_2\text{SO}_4$ . The mixt. is titrated with 0.1  $N$   $\text{KMnO}_4$  standardized against pure Sb powder. If Sn and Cu are present ( $\% \text{Sn} \times 0.4 + \% \text{Cu}$ ) + 100 cc. is deducted from the result of the titration. Arsenic may be subtracted directly. If more than 0.3% Fe is present the preliminary soln. must be made in HCl and  $\text{KClO}_3$  and the Sb pptd. from the dild. soln. by an Fe rod, filtered off, and treated as above. For the estn. of Sn the Sb is pptd. and filtered off through a filter strewn with Fe filings.  $\text{CO}_2$  is passed through the filtrate, which is titrated with I and starch.

E. J. C.

Determination of molybdenum. K. WOLF. *Z. angew. Chem.* 31, I, 140(1918); *J. Soc. Chem. Ind.* 37, 561A.—The conversion of a ppt. of Mo sulfide into  $\text{MoO}_3$  by igni-

tion is not quant. if the temp. rises above  $450^{\circ}$ , as sublimation then occurs to an appreciable extent. A temp. of  $400^{\circ}$  suffices and it is most convenient and certain to ignite the ppt. in an electrically heated furnace at a temp. of  $425^{\circ}$ . E. J. C.

**Determination of lead in ores, etc.** W. STAHL. *Chem. Ztg.* 42, 317(1918); *J. Soc. Chem. Ind.* 37, 548A.—A weighed quantity of the finely divided sample is mixed with about 500 cc. of water, acidified with  $\text{HNO}_3$ , and heated at  $40^{\circ}$  for 2 hrs. The mixt. is then dild. with water, treated with  $\text{H}_2\text{S}$ , filtered, and the insol. portion washed with warm water contg. a small quantity of K sulfide. The insol. portion is then heated with  $\text{HNO}_3$  until all S has been oxidized, the soln. evapd. with the addition of  $\text{H}_2\text{SO}_4$  and the  $\text{PbSO}_4$ , etc., collected and washed with dil.  $\text{H}_2\text{SO}_4$ . The ppt. is then extd. with warm ammoniacal  $\text{NH}_4$  tartrate soln., filtered, and the insol. portion washed with warm water. The filtrate now contains the  $\text{PbSO}_4$  together with Sb; the Sb remains in soln. when the filtrate is acidified with  $\text{H}_2\text{SO}_4$  and mixed with alc., while the  $\text{PbSO}_4$  is re-pptd. and is collected, dried, and weighed. E. J. C.

**Volumetric determination of lead in tin-plate.** J. DEININGER. *Z. Nahr. Genussm.* 36, 66-7(1918); *J. Soc. Chem. Ind.* 37, 736-7A.—Heat about 0.5 g. of the metal with 10 cc. of concd.  $\text{H}_2\text{SO}_4$  until metallic particles are no longer visible; after cooling add 20 cc. of 5%  $\text{NH}_4$  oxalate and again heat the mixt. in order to dissolve remaining traces of Fe. Then add alc., collect the  $\text{PbSO}_4$ , wash with dil. alc., then dissolve in 15 cc. of hot 50%  $\text{AcONa}$  soln., and add Br water, drop by drop, to the warm soln. until a slight excess is present. After 5 min., collect the pptd.  $\text{PbO}_2$ , wash with hot water, rinse into a beaker with cold satd.  $\text{AcONa}$  soln., and treat with 20 cc. of 5% KI soln. and 10 drops of  $\text{AcOH}$ . The  $\text{PbO}_2$  decomposes rapidly; titrate the liberated I with  $\text{Na}_2\text{S}_2\text{O}_3$  soln. Each cc. of 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  soln. is equiv. to 0.01036 g. Pb. The  $\text{PbSO}_4$  obtained by the treatment with  $\text{H}_2\text{SO}_4$  contains Sn, and if weighed directly the results obtained are much too high. E. J. C.

**Gravimetric determination of copper by means of sodium nitroprusside, and the separation of copper from mercury.** E. VOTOCERK AND J. PAZOUERK. *Chem. Ztg.* 42, 475-6(1918); *J. Soc. Chem. Ind.* 37, 751A.—Mix a cupric salt with an excess of Na nitroprusside soln. acidified with dil.  $\text{H}_2\text{SO}_4$ , dil. the mixt. to 170 cc., and shake for 2 to 4 hrs.; then collect the pptd. cupric nitroprusside on a tared filter, wash with water, dry at  $110^{\circ}$ , and weigh; it contains 22.75% Cu. The yield averages 99.2% of the amt. of Cu present. To det. Cu in the presence of Hg, ppt. the Cu as cupric nitroprusside as described, but in this case also add a known excess of 0.1 N NaCl soln. to prevent pptn. of mercuric nitroprusside. Then ppt. the Hg in the filtrate from the Cu ppt. as sulfide or det. by titrating the excess of NaCl with standard Hg soln. The presence of Pb and Bi does not interfere with the detn. of Cu, but Sn salts should not be present. E. J. C.

**Determination of copper by means of potassium thiocyanate and potassium iodide.** G. BRUHNS. *Centralbl. Zuckerind.* 26, 354-6(1918); *Z. angew. Chem.* 31, II, 310; *J. Soc. Chem. Ind.* 37, 751A.—In the estn. of Cu in Fehling soln., by means of KCNS and KI, by the method previously described (cf. C. A. 12, 2293), considerable errors may occur if the acidified Cu soln. is allowed to stand for some time after the addition of KCNS before being titrated with thiosulfate soln. These errors are due to the gradual formation of insol. CuCNS, the Cu thus pptd. being removed from the iodometric estn. E. J. C.

**Determination of tungsten and vanadium in the presence of titanium.** G. FENNER. *Chem. Ztg.* 42, 403(1918); *J. Soc. Chem. Ind.* 37, 609A.—When a mineral, etc., contg. W and Ti is fused with  $\text{Na}_2\text{O}_2$ , the melt then treated with water, boiled for a few mins., and filtered, the Ti remains insol. in the Fe ppt. while the W is completely

sol. and is found in the filtrate. V, if present in small quantity (less than 0.5%), remains almost entirely insol., but in larger quantity a portion is found in the filtrate. To det. V in the presence of Ti treat the mineral with HF and  $\text{H}_2\text{SO}_4$  to remove silica, then fuse the residue with  $\text{Na}_2\text{S}_2\text{O}_7$ , dissolve the melt in dil.  $\text{H}_2\text{SO}_4$ , filter the soln., and treat the filtrate with  $\text{H}_2\text{O}_2$  until a distinct yellow coloration has developed, a large excess of peroxide being avoided. Then add  $\text{NH}_4\text{F}$  or HF, whereby the yellow color of the Ti compd. is destroyed, while the red-brown coloration of the V compd. remains unaffected. Add  $\text{H}_3\text{PO}_4$  to remove color due to Fe salts, and det. the V colorimetrically by comparison with a standard prepd. with the same quantities of reagents.

E. J. C.

Simplification and modification of my process of determining phosphorus in pig iron and determination of silica. A. CAVAZZI. *Ann. chim. applicata* 10, 137-49 (1918); cf. C. A. 11, 3192.—The method is as follows: Take 5 g. of the reduced and powdered material, wash well with  $\text{Et}_2\text{O}$  to remove fatty substances, place in a 600 cc. beaker, and add at once 60 cc. 1:1  $\text{HNO}_3$ , immediately covering the vessel with a watch glass. Allow to dissolve, starting soln. with slight warming if necessary. When nitrous vapors cease coming off heat carefully and keep at slight ebullition till the yellow-red nitrous vapors disappear under the watch glass. Pour the liquid into a porcelain dish of 20 cm. diam., together with the rinsings made by warm  $\text{H}_2\text{O}$  slightly acidulated with  $\text{HNO}_3$ . Add 9 cc. concd.  $\text{H}_2\text{SO}_4$  and heat the dish on a gauze with ring burner to light boiling of the soln. and keep so, agitating lightly only on the bottom of the dish. This agitation may be omitted with very dense and viscous solns. of  $\text{Fe}_2(\text{SO}_4)_3$ . After continued careful concn., white fumes of free  $\text{H}_2\text{SO}_4$  appear. Increase the heat, but not so much as to cause the gauze to take on more than an incipient red color. Continue till no more white fumes are seen and the mass becomes friable and grayish yellow. Allow to cool, loosen the crust adhering to the walls of the dish and pulverize finely in the same dish with a glass pestle. Heat again, stirring the powder from time to time to drive out all the free  $\text{H}_2\text{SO}_4$ . Place the powder in a 150-cc. beaker, add about 10 cc.  $\text{H}_2\text{O}$  that has been used to wash out the porcelain dish, using a policeman or rubber glove on the index finger, add 40 cc.  $\text{H}_2\text{O}$  and 10 cc. concd.  $\text{HNO}_3$ . (On this matter of addn. of  $\text{HNO}_3$ , C. mentions the following expt.: Taking 20 cc. of a boiling soln. containing 3 g.  $\text{Fe}_2(\text{SO}_4)_3$ , 1 cc. concd.  $\text{HNO}_3$ , 0.0173 g. crystd.  $\text{Na}_2\text{HPO}_4$  and 3 g.  $\text{NH}_4\text{NO}_3$ , i. e., a soln. comparable to that obtained from 1 g. cast Fe with 0.15% P, he added rapidly 20 cc. of a boiling soln. containing 0.6 g.  $\text{NH}_4$  molybdate, keeping the temp. at about  $80^\circ$ . The soln. remained limpid even after 10 min. agitation. He then added another cc. concd.  $\text{HNO}_3$ . After 2 min. and even less of agitation, the liquid began to cloud and the yellow ppt. of phosphomolybdate deposited increasingly rapidly.) Place a flask of cold water so that the spherical surface rests over the mouth of the beaker, and close up the opening at the lip of the beaker by inserting a glass rod into it. Heat over a metal gauze to light boiling and keep so for 30-45 min. Every 10-15 min. replace the flask by another, also containing cold water. The  $\text{Fe}_2(\text{SO}_4)_3$  is now completely dissolved. Allow the liquid to cool, pour into a 9 cm. smooth filter, wash the  $\text{SiO}_2$  and C upon the filter 6 times with boiling  $\text{H}_2\text{O}$  slightly acidulated with some drops of  $\text{HNO}_3$ . To cut down the time of filtration make use of a suction flask and moderate aspiration, putting the point of the filter in a Pt cone. (C. describes a simple aspirator designed to avoid danger of rupturing the filter.) Transfer the filtrate to a 300-cc. beaker together with the washings. Add 15 g. solid crystd.  $\text{NH}_4\text{NO}_3$ , heat, and when the liquid begins to boil add rapidly and at once 40 cc. of a boiling soln. containing 5 g.  $\text{NH}_4$  molybdate, agitating immediately and vigorously continuing for some minutes. Maintain the liquid at  $70$ - $80^\circ$  for 30 min. This warming favors the formation of the  $\text{NH}_4$  phosphomolybdate and is especially necessary when small

amounts of  $\text{H}_2\text{PO}_4$  are present. Allow to cool, filter on a 7-cm. filter, wash the ppt. by decantation with a boiling soln. of  $\text{NH}_4\text{NO}_3$  (25 g. of the latter with 20 cc. 1.153  $\text{HNO}_3$  in 500 cc.  $\text{H}_2\text{O}$ ). Carry out the decantation washing by adding 20 cc. of the boiling acid soln. to the ppt. in the beaker, agitating for 1 min. with a rod, allowing the liquid to rest for 2 min. and pouring the clear soln. upon the filter. Repeat 4 times. Discard the filtrate. Dissolve the slight amt. of ppt. on the filter with 1:3  $\text{NH}_4\text{OH}$ , wash 5 or 6 times with  $\text{H}_2\text{O}$ , collecting the whole in the beaker containing the major part of the phosphomolybdate. Dissolve this in the ammoniacal liquid by agitation. It is advisable to reprecipitate, in order to purify from possible presence of Fe. The same object may be secured in the following way: Add at once to the cold ammoniacal soln. of the phosphomolybdate 3 g.  $\text{NaCl}$ , bring to boiling, and keep boiling for 10 min. in order to drive out a certain part of the free  $\text{NH}_3$ . Under these conditions, and especially because of the presence of  $\text{NaCl}$ , the Fe remaining in the phosphomolybdate seps. completely as  $\text{FePO}_4$ . Filter on a 5.5 cm. filter, keeping the soln. very warm, wash the ppt. 6 times with a boiling soln. of 1 g.  $\text{NaCl}$  in 50 cc.  $\text{H}_2\text{O}$ . Place the still moist filter with ppt. into a Pt crucible and ignite. Drop the red ashes into a small mortar, mix ultimately with about 0.3 g.  $\text{NaKCO}_3$  and a little  $\text{KNO}_3$ . Fuse, stopping the heating when the development of bubbles has ceased. Cool. Add 6 portions of 3 cc. each of boiling  $\text{H}_2\text{O}$ , filter on a 4-cm. filter into a small beaker. Add a few drops of  $\text{HNO}_3$  to strong acid reaction, boil for 10 min., neutralize with  $\text{NH}_4\text{OH}$  to strong odor, and add the liquid to the soln. previously sepd. from the  $\text{FePO}_4$ . Now add 3 g. solid  $\text{NH}_4\text{Cl}$ , bring to boil, then pour into it  $\frac{1}{4}$  of its vol. of concd.  $\text{NH}_4\text{OH}$  and add from a buret while agitating the liquid without interruption 10 to 20 cc. non-acid magnesia mixt. (55 g. crystd.  $\text{MgCl}_2$  + 105  $\text{NH}_4\text{Cl}$  in a l.  $\text{H}_2\text{O}$ ). Continue agitation for a few min., allow to cool for not less than  $\frac{1}{2}$  hr. and filter on a 5.5 cm. filter. Wash the  $\text{NH}_4\text{-MgPO}_4$  15 times with 1:4  $\text{NH}_4\text{OH}$ , dry, filter and ppt. for 1 hr. at  $100^\circ$ , sep. ppt. from filter, incinerate the latter in a weighed Pt crucible, moisten the generally black residue with 3 drops concd.  $\text{HNO}_3$ , evap. gently to dryness, ignite over the blast to whiteness. Cool, add the sepd. ppt., heat for at least 15 min. at a dark red heat with crucible covered. Cool, add 5-6 drops concd.  $\text{HNO}_3$ , evap. gently and carefully. Heat strongly over the blast for at least 5 min. and weigh as pyrophosphate. C. confirmed the simplicity, certainty and accuracy of the method by many analyses. He makes the following suggestions to assure complete pptn. of the phosphomolybdate, and at the same time avoid the use of large quantities of molybdate soln. in analyzing cast irons where the content in P is approx. known. Prep. the  $\text{HNO}_3$  soln. of the  $\text{Fe}_2(\text{SO}_4)_3$  for 6 g. alloy instead of for 5 g. Bring the soln. to exactly 180 cc. by addn. of  $\text{H}_2\text{O}$ . Call this the "final soln." Take 30 cc. of this and if the P content is 0.15% or less add to it at the boiling temp. 0.75 g. dry molybdate dissolved in about 20 cc.  $\text{H}_2\text{O}$ . Keep for 15 min. at  $70-80^\circ$  stirring with a rod. If the pptn. is complete ppt. the remaining 150 cc. of the "final soln.," corresponding to 5 g. alloy, with 4 g. molybdate dissolved in 30 cc.  $\text{H}_2\text{O}$ . Of course the phosphomolybdate formed in the 30 cc. portion of the "final soln." is discarded. For alloys containing about 0.3% P makes the test on 30 cc. of the "final soln." as before, allow to cool and the phosphomolybdate to settle, filter the supernatant liquid on a 7-cm. filter without washing. After each new addn. of molybdate repeat these operations. The successive addn. of molybdate, after the first of 0.75 g., are 0.1, 0.05 and 0.05. In the 3 final addns. the molybdate is dissolved in smaller portions of  $\text{H}_2\text{O}$ . There is obtained with the last portion a soln. which does not become turbid with further addn. of the reagent after maintaining for 15 min. at  $70-80^\circ$  and stirring. In that case treat the balance of the "final soln." with 5 g. molybdate in 40 cc.  $\text{H}_2\text{O}$ . With alloys containing 0.5% P, the preceding procedure is followed out, using 4 successive portions of molybdate after the first of

0.75 g.—*i. e.*, 0.1, 0.1, 0.05, 0.05. If the final portion completes the pptn. of the phosphomolybdate, use 120 cc. of the "final soln." for the actual analysis, treating it with 5 g. molybdate in 40 cc.  $H_2O$ . Where the P content is between 0.5 and 3.0%, the successive addns. of molybdate in the 30-cc. test soln. become too numerous and complicated. A better way is as follows: Take a 30-cc. portion as before, add 8 cc. concd.  $HNO_3$  and 12 g.  $NH_4NO_3$ . Bring to boiling, pour into it at one time while stirring, a soln. of 5 g. molybdate in 50 cc.  $H_2O$ . If the ppt. is abundant continue the operation as in the full method, thus obtaining the  $Mg_3P_2O_7$ , corresponding to 1 g. cast Fe. If the phosphomolybdate is comparatively scant, agitate and bring the turbid liquid again to boiling and add another 30 cc. portion of the "final soln." Assure yourself that the molybdate is in excess by heating 20 cc. of the clear liquid with 0.05 g. molybdate dissolved in a little  $H_2O$ . The  $Mg_3P_2O_7$  obtained will correspond to 2 g. cast Fe. C's method of detg.  $SiO_2$  and C is as follows: After having washed the residue of  $SiO_2$  and C as described in the previous method 6 times with  $H_2O$  acidulated with  $HNO_3$ , continue the washings with boiling  $H_2O$  made strongly acid with  $HNO_3$  and  $HCl$  to sep. from the  $SiO_2$  every trace of Fe compd. Dry the filter with residue in the oven, sep. the ppt. from the filter and burn the latter in a Pt crucible. Mix the little ash produced intimately with the material sepd. from the filter and weigh. Where 5 g. cast Fe have been taken take about  $\frac{1}{8}$  or  $\frac{1}{16}$  of the latter mixt., according as the metal is more or less rich in C and Si, *i. e.*, amounts corresponding to 1 or 2 g. cast Fe, ignite in a weighed Pt crucible over the blast lamp till the C disappears. The increase in wt. of the concn. equals the amt. of  $SiO_2$ , which multiplied by 0.46932, gives Si. If it is desired to det. only the amount of Si in a cast Fe, treat 1 or 2 g. of the metal in fine granules or shavings in a 400 cc. beaker with 30 or 40 cc. 1:1  $HNO_3$ . Carry out as in the full method, but to the  $HNO_3$  soln. evapg. in the porcelain dish add 2 cc. instead of 9 cc.  $H_2SO_4$ . After all the  $H_2SO_4$  has been driven out continue the baking of the residue of  $Fe_2(SO_4)_3$ ,  $SiO_2$  and graphitic C about  $\frac{1}{2}$  hr. longer than in the full method, then introduce it into a beaker with 50 cc. 1:9  $HNO_3$  with a little  $H_2O$  that has been used to wash the dish. Digest for 30 min., with a flask of cold water over the dish, renewed every 15 min. to serve as condenser. Cool, filter and wash on a 6-cm. filter 15 times with boiling  $H_2O$  made strongly acid with  $HNO_3$  using gentle aspiration if necessary to hasten filtration. Place moist filter in a covered and weighed Pt crucible. Heat moderately to carbonization of the filter and stopping of volatile vapors, remove lid from the crucible and ignite strongly over the blast. The  $SiO_2$  should be very white. With metals very poor in Si, make the detn. upon 4 or 5 g.

ROBERT S. POSMONTIER.

**Determination of white phosphorus in mouse poisons.** F. MACH AND B. LEDERLE. *Chem. Ztg.* 42, 491(1918); *J. Soc. Chem. Ind.* 37, 747A.—Ten g. of the material are mixed with 5 g. of plaster of Paris, the powdered mixt. is transferred to a 200-cc. cylinder and shaken for 1 hr. with 100 cc. of  $CS_2$ . After settling, 10 cc. of the clear soln. are withdrawn and added to 50 cc. of satd. Br soln. The oxidation of the P by the Br is complete in 1 hr. at the ordinary temp. and the resulting  $H_3PO_4$  is pptd. as  $MgNH_4PO_4$  after the  $CS_2$  and the excess of Br have been evapg.

E. J. C.

**Rapid method of reduction of potassium chloroplatinate.** HORSCH. *Compt. rend.* 168, 167-9(1919).—After washing with 80% alc., dissolve the moist ppt. of  $K_2PtCl_6$  in boiling  $H_2O$ , receiving the soln. in a weighed Pt crucible; add 2 or 3 cc. of alc. and heat on a boiling  $H_2O$  bath. After  $\frac{1}{2}$  to 1 min. a firmly adhering layer of metallic Pt deposits gradually and uniformly on the inner surface of the crucible. When reduction is complete (about 25 min.), add a few drops of alc. and let stand 5 min.; decant off the soln. and wash with  $H_2O$ , dry on the  $H_2O$  bath, and ignite strongly until the deposit assumes the color of the crucible. Complete reduction by alc. takes place only in the

presence of metallic Pt; HCHO reduces the  $K_2PtCl_6$  more slowly, yielding a less adherent deposit; allyl alc. produces no reduction, even in the presence of metallic Pt. The method is suggested as a procedure for repairing Pt ware. F. W. SMYTH.

**Determination of free and carbonated alkalis in alkaline solutions of hypochlorites.** M. PHILIBERT. *J. pharm. chim.* 18, 260-72(1918); cf. Mestrezat, *C. A.* 12, 1787, 2178.—(I) In detg. *total alkali* ( $A_t$ ), P. first removes the oxidizing agent (Cl or NaClO) by means of  $Na_2S_2O_3$ , not in alk. (Mestrezat) but in *acid* soln. (definite excess) in the presence of an excess of KI. This incidentally detg. the amt. of active Cl, and it causes a definite amt. of added acid to disappear:  $2 HCl + 2 KI + NaClO = NaCl + H_2O + 2 KCl + I_2$ . The remainder of the excess acid, P. detg. by the Kjeldahl use of  $KIO_3$  as follows:  $6HCl + KIO_3 + 5 KI = 6KCl + 3H_2O + 6I_2$ . In both cases, 1 equiv. of I indicates 1 equiv. of HCl. For Kjeldahl's soln., mix equal vols. of 0.5 g.  $KIO_3$  per 100 cc. and 3.0 g. KI per 100 cc. and decolorize with a few drops of  $Na_2S_2O_3$ . P. proceeds as follows: To 10 cc. of alk. NaClO soln. add 5 cc. of 20% KI and 30 cc. 0.1 N HCl or  $H_2SO_4$ , i. e., an excess of acid, and titrate I with 0.1 N  $Na_2S_2O_3$ . Now add 60 cc. of Kjeldahl mixt., which sets I free at once if HCl is in excess; titrate I with the same thio soln. The total vol. of  $Na_2S_2O_3$  subtracted from the total HCl used, gives cc. of 0.1 N total alkali.  $CO_2$  having a slight influence, a correction of 0.1 cc. for much carbonate present, and 0.2 cc. for  $NaHCO_3$  is subtracted from the vol. of  $Na_2S_2O_3$  consumed. (II) To det. *free* (a) *carbonated* (b) or *bicarbonated* (c) *alkali* ( $A_b$ ), ppt. b with  $BaCl_2$  if only a and b are present. In presence of c convert it into b by adding a definite excess of 0.1 N  $Ba(OH)_2$  soln. Proceed as follows: To 20 cc. NaClO soln. add excess of 0.1 N  $Ba(OH)_2$  soln., i. e., equal to twice the no. of cc. of total 0.1 N alkali found under (I), then 5 cc. of 20%  $BaCl_2$  soln., fill up to 100 cc. with  $CO_2$ -free  $H_2O$ , stir, allow to stand for 2 or 3 min., filter. Collect 50 cc. filtrate (= 10 cc. hypochlorite), then treat as under (I) for total alkali with KI, excess of HCl, then Kjeldahl soln. and det. total  $Na_2S_2O_3$  soln. Total alkali = total acid — ( $\frac{1}{2} Ba(OH)_2$  + total  $Na_2S_2O_3$ ). The resulting values are positive for total and free alkali, negative for bicarbonate. Five or 6 possibilities are considered: (1) Only free alkali is present; then  $A_b > 0$ ,  $A_t - A_b > 0$ .  $BaCl_2$  gives no ppt. (2) Free alkali ( $A_b$ ) and neutral carbonate ( $A_t - A_b$ ) are present. Then  $A_b > 0$ ,  $(A_t - A_b) > 0$ .  $BaCl_2$  ppts. only part of the alkali. (3) Only carbonate ( $A_t$ ) is present.  $A_b = 0$ .  $BaCl_2$  ppts. all alkali. (4) A mixt. of neutral carbonate ( $A_t - A_b$ ) and bicarbonate ( $A_b$ ) is present.  $A_b < 0$ ;  $(A_t - A_b) > 0$ .  $BaCl_2$  ppts. more alkali than the original liquid contained. (5) The soln. contains bicarbonate only. Then  $A_b < 0$ , and  $(A_t - A_b) = 0$ . Pptn. has taken away just twice as much alkali as the sample contained. (6) A possible excess of  $CO_2$  ( $A_b - A_t$ ) is present. In this case, more  $Ba(OH)_2$  must be added than previously.  $A_b = 0$ ;  $(A_t - A_b) < 0$ . The results of P.'s method, compared with those of Mestrezat, on 2 solns. of, resp.,  $Na_2CO_3$ , 10  $H_2O$  and  $KHCO_3$ , and an equal vol. mixt. thereof, and on Dakin's soln., are recorded in 4 tables. P. concludes: (1) Only when destruction of NaClO takes place in *acid* soln. in presence of KI, results in total alkali will be const. Results are uncertain in alk. soln., due to opposite reactions: Oxidation to  $Na_2SO_4$  and free acid if  $Na_2S_2O_3$  soln. is present in small amt.; or formation of  $Na_2S_4O_6$  and free NaOH by the action of NaClO if  $Na_2S_2O_3$  is in excess. (2) The only exact process for detg.  $CO_2$  in  $Na_2CO_3$  is the "classic" method with  $BaCl_2$ , although that of Mestrezat, with phenolphthalein and litmus, or as modified by P. with litmus alone, gives approx. results. (3) The iodate method described is simple and sufficiently exact, results varying only about 2%.

S. WALDBOTT.

**Source of error in the determination of sulfur in pyrite.** O. BINDER. *Chem. Ztg.* 42, 503(1918); *J. Soc. Chem. Ind.* 37, 730A.—To insure thorough mixing of the  $Na_2CO_3$  and  $KNO_3$  in prepg. a stock of fusion mixt., it is recommended that the  $Na_2CO_3$

be suitably colored and the mixing then continued until the color of the whole mixt. is uniform.

E. J. C.

**Analysis of scrap metals and dross, etc. Analysis of cement copper.** O. BINDER. *Chem. Ztg.* 42, 546(1918); *J. Soc. Chem. Ind.* 37, 770A.—Specimens of scrap metals or dross, etc., usually contain large pieces of metal more or less coated with oxide, and it is impossible to obtain a fair av. sample for analysis; it is recommended that, after finer portions of the sample have been sepd. by a sieve, the larger pieces should be melted together and then filed so as to obtain a portion for weighing. In the detn. of Cl in cement Cu, soln. of the sample in  $\text{HNO}_3$  brings about loss of Cl, and the Cu is not dissolved completely.

R. H.

**Determination of active oxygen in sodium peroxide.** J. MILBAUER. *J. prakt. Chem.* 98, 1-8(1918); *J. Soc. Chem. Ind.* 38, 10A.—Methods depending on the liberation of  $\text{H}_2\text{O}_2$  by water, followed by titration with  $\text{KMnO}_4$ , and on the treatment of  $\text{Na}_2\text{O}_2$  with KI and  $\text{KHCO}_3$  and titration of the liberated I with Na arsenite give low results, while measurement of the O liberated by water in the presence of  $\text{Co}(\text{NO}_3)_2$  gives high results. The following processes yield accurate results: (1) Water (100 cc.) is mixed with concd.  $\text{H}_2\text{SO}_4$  (5 cc.) and chemically pure  $\text{H}_3\text{BO}_3$  (5 g.);  $\text{Na}_2\text{O}_2$  (0.5 g.) is added gradually to the mixt. which is kept briskly shaken, and the liberated  $\text{H}_2\text{O}_2$  is titrated with  $\text{KMnO}_4$ . The low results given by the older permanganate method are to be attributed to the catalytic decompn. of a portion of the  $\text{H}_2\text{O}_2$  by the  $\text{MnSO}_4$  formed during the titration. (2)  $\text{Na}_2\text{O}_2$  is introduced gradually into a soln. of KI (2 g.) in dil.  $\text{H}_2\text{SO}_4$  (1 in 20; 200 cc.); the I is titrated with standard  $\text{Na}_2\text{S}_2\text{O}_3$ . The results agree with those obtained by the permanganate method. (3)  $\text{Na}_2\text{O}_2$  (0.2-0.3 g.) is mixed with about 10 cc. of Cu sulfate soln. (0.05%) in a small flask connected to a nitrometer; the flask is shaken, and decompn. is completed within a minute, when the liberated O is measured. The gas evolved contains about 0.32% of  $\text{CO}_2$  and 0.08% of H. With  $\text{Co}(\text{NO}_3)_2$  as catalyst, the results are invariably high; M. considers that this may indicate the presence of an oxide higher than the peroxide. The action of the atm. on  $\text{Na}_2\text{O}_2$  has also been investigated; moisture appears to be more active than  $\text{CO}_2$  in causing decompn.

E. J. C.

**Determination of chlorine in mixtures containing silicates.** G. BRUHNS. *Z. angew. Chem.* 31, I, 156(1918); *J. Soc. Chem. Ind.* 37, 578A.—Cl can be detd. by titration with  $\text{AgNO}_3$  in the presence of dissolved or gelatinous silicic acid (water glass, detergents, etc.), provided that the liquid is made neutral to phenolphthalein with  $\text{HNO}_3$  and any resulting gelatinous mass is finely distributed by trituration or shaking.

E. J. C.

**The gravimetric determination of sulfate as barium sulfate.** I. M. KOLTHOFF AND E. H. VOGELZANG. *Utrecht. Pharm. Weekblad* 56, 122-42(1919).—The literature of  $\text{BaSO}_4$  detns. is reviewed, with the following conclusions: The soly. of  $\text{BaSO}_4$  (2.3 mg. per l. at room temp.) is much increased by rising temp. or by the presence of  $\text{HNO}_3$ , and to a less extent by the presence of  $\text{HCl}$ . Dry ignition in porcelain, or moist ignition in Pt, causes little or no reduction; dry ignition in Pt causes a great deal. It is advisable in any case to add a few drops of  $\text{H}_2\text{SO}_4$  and ignite again to const. wt. The statement of Pregl (*Quantitative organische Microanalyse*, p 29(1917)), that occluded salts can be washed out after ignition, is incorrect. The occlusion of  $\text{BaCl}_2$ , nitrates, Ca, Fe and K is chem. in nature. The error caused by the presence of phosphates is due to the formation of the Ba phosphate. It is impossible to prescribe a general procedure for the accurate detn. of  $\text{SO}_4$  in arbitrary mixts. Cf. following abstr.

JULIAN F. SMITH.

**The determination of sulfates as strontium sulfate.** I. M. KOLTHOFF AND E. H. VOGELZANG. *Utrecht. Pharm. Weekblad* 56, 159-61(1919).—The detn. of  $\text{SO}_4$



as  $\text{SrSO}_4$  is subject to the same errors as in the case of  $\text{BaSO}_4$ . The use of 50% EtOH makes the soly. sufficiently low; but free acids and certain salts, especially  $\text{NH}_4$  salts, act as disturbing factors. The soly. of  $\text{SrSO}_4$  in mg. per l., was detd. at  $19^\circ$  for different solvents as follows: 25% EtOH, 19; 50% EtOH, 0; 50% EtOH + 0.1 N HCl, approx. 120; 50% EtOH + 0.1 N  $\text{NH}_4\text{Cl}$ , approx. 40;  $\text{H}_2\text{O}$ , approx. 114. Cf. preceding abst.

JULIAN F. SMITH.

**Sampling of dust in mine-air.** J. BOYD. *Eng. Mining J.* 107, 395-6(1919).—The method, evolved on the Rand, consists in passing a known vol. of air through a known wt. of pure sucrose. The sucrose, dampened with the moisture present in the mine air, becomes sticky and catches all of the dust in the air passed through it. The sucrose is then dissolved in hot  $\text{H}_2\text{O}$  and the residue of dust filtered off and weighed. An air suction pump consisting of a metal cylinder 22 in. high and of 3 in. diam., double acting and fitted with ball valves, is the principal part of the sampling app. The pump should be calibrated at least once a month against a standard air meter. The sucrose containers consist of a glass tube (5 in.  $\times$   $1\frac{1}{4}$  in.) fitted at the top with a solid rubber stopper and at the bottom with a rubber stopper through which passes a glass tube. On top of the latter stopper is placed a wad of cotton wool; then 40 g. of sucrose, ground to pass a 10-mesh and remain on a 20-mesh sieve, are placed in the tube, and the solid stopper is inserted. The inlet pipe in the pump and the glass tube projecting from the bottom of the sugar tube are connected by 6 ft. of  $\frac{1}{2}$ -in. rubber tubing. The details of testing the app. and taking samples, and the the precautions to be observed, are given.

F. W. SMITHER.

**Silver-asbestos, lead chromate-asbestos and lead peroxide-asbestos for use in combustions.** O. BINDER. *Chem. Ztg.* 42, 522(1918); *J. Soc. Chem. Ind.* 37, 784A. —The use of Ag-asbestos is recommended in place of Ag foil for the removal of Cl in combustion analyses. It is prepd. by reducing ammoniacal  $\text{AgNO}_3$  soln. with metallic Zn, washing and drying the finely divided pptd. Ag, and then mixing it with ignited asbestos. A mixt. of asbestos and  $\text{PbCrO}_4$  or  $\text{PbO}_2$  is useful for the absorption of S compds.

E. H.

**Separation of formic, acetic, and lactic acids.** I. ONODERA. *Ber. Ohara Inst. landw. Forsch.* 1, 231-59(1917); *J. Soc. Chem. Ind.* 37, 715-6A.—The soln. contg. the 3 acids is extd. with ether for 4 hrs. in a modified Soxhlet app., the extn. flask contg. an excess of 0.1 N NaOH soln. The excess of alkali is then neutralized with 0.1 N  $\text{H}_3\text{PO}_4$  soln. (this gives a measure of the total acidity), an excess of  $\text{H}_3\text{PO}_4$  is added, and the mixt. steam-distd. at  $140$ - $160^\circ$  for 2 hrs. or until the distillate no longer shows an acid reaction; the distillate is collected in an excess of alkali soln., the latter neutralized with  $\text{H}_2\text{SO}_4$  and dild. to a definite vol. To det. the formic and lactic acids an aliquot portion of this soln. is treated with 1.5 g. of  $\text{Na}_2\text{CO}_3$  and an excess of 0.1 N  $\text{KMnO}_4$  soln., dild. to 100 cc., and heated at  $100^\circ$  for 35 min., and the excess  $\text{KMnO}_4$  detd. iodometrically. Another portion of the soln. is then heated for 1 hr. at  $100^\circ$  with the addition of 1.5 g. of  $\text{Na}_2\text{CO}_3$  and excess of 3.2%  $\text{KMnO}_4$  soln., the excess of the latter is destroyed with  $\text{H}_2\text{O}_2$ , the mixt. filtered, the filtrate evapd., and the oxalic acid formed by the oxidation of the lactic acid is pptd. as Ca oxalate and this is titrated in the usual way with permanganate soln. Each cc. of 0.02  $\text{KMnO}_4$  soln. is equiv. to 0.0009 g. of lactic acid; the formic acid is found by difference. AcOH is detd. by oxidizing a third portion of the soln. as described, decomposing the excess of  $\text{KMnO}_4$  with  $\text{H}_2\text{O}_2$ , evapg. the filtered liquid, acidifying the residual liquid with  $\text{H}_2\text{SO}_4$ , and extg. it with ether, the extn. flask in this case contg. a small quantity of water. A portion of the ext. is then dild. to 100 cc. and distd., 95 cc. of distillate being collected and titrated. Under these conditions 84.49% of the AcOH is found in the distillate.

E. J. C.

**Determination of fructose in the presence of aldoses.** HERZFELD AND LENART. *Zentr. Zuckerind.* 68, 227(1918); *Chem. Ztg.* 42, 135; *J. Soc. Chem. Ind.* 37, 632A.—A quantity of the substance contg. about 1 g. of fructose is dissolved in water, the soln. clarified with Pb acetate, dild. to 100 cc., and filtered; 50 cc. of the filtrate is then inverted (Clerget-Herzfeld method), cooled, and treated with Br, 1 cc. of the latter being added for each g. of aldose present. The mixt. is shaken occasionally for 24 hrs., whereby the aldoses, and these only, are oxidized. The excess of Br is evapd. on the water bath, the mixt. neutralized, then treated with a few drops of AcOH, dild. to 100 cc., and the fructose detd. from the reducing power of the soln., using the Hönig-Jesser table. E. J. C.

**Determination of halogens in organic compounds by catalytic reduction.** M. BUSCH. *Z. angew. Chem.* 31, I, 232(1918); *J. Soc. Chem. Ind.* 38, 57A.—In the catalytic reduction of org. halogen compds. by means of Pd, hydrazine (which is decomposed by the catalyst into N and H) may be substituted with advantage for a current of purified H (cf. C. A. 10, 2727). Dissolve 0.2 g. of the org. compd. in 40–50 cc. of alc.; add 2 g. of palladinized  $\text{CaCO}_3$  or  $\text{BaSO}_4$ , 2.5 cc. of 50% KOH, and 10 drops of hydrazine hydrate. Boil the liquid under a reflux condenser for  $\frac{1}{2}$  hr. after which expel the bulk of the alc. by heating. Filter off the catalyst, and det. the halogen in the filtrate. E. J. C.

Some properties of magnesium ammonium phosphate and magnesium pyrophosphate (KARAOGLANOW, DIMITROW) 6. Recovery of molybdenum from residues (MALOWAN) 6. Cuprosodic reagent for the detection and determination of sugar (JUSTIN MUELLER) 11B. Determination of hypophosphates and phosphites (BOYER, BAUZIL) 17. Apparatus for measurement of gases in volumetric analysis (FINCKE) 1. Stable silver nitrate solution (LIEBERT) 2. Apparatus for determining ammonia (ORCEL) 1. Apparatus for the continuous testing of gases (KING) 1. Analysis of antimony pentasulfide (REPNY) 30. New Vulcan-Orsat flue gas analyzer (ANON.) 1.

## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY AND J. H. BOWER.

**Crystallography of some Canadian minerals: stephanite, epidote, and calamine.** EUGENE POITEVIN. *Geol. Survey Can. Am. Mineral.* 4, 22–5(1919); cf. C. A. 13, 551.—The associations and crystallography of occurrences of these 3 minerals are described in detail. E. T. W.

**An unusual sulfur crystal.** F. RUSSELL BICHOWSKY. *J. Wash. Acad. Sci.* 9, 126–31(1919).—A crystallographic description of a rhombic S crystal formed by the accidental mixing of a hot EtOH soln. of  $(\text{NH}_4)_2\text{Sx}$ , with a mixt. of benzonitrile, hydroxylamine hydrochloride, and  $\text{Et}_2\text{O}$ . All available data on the crystallography of this form of S are summarized. S. G. GORDON.

**Planchete and shattuckite, copper silicates, are not the same mineral.** WALDEMAR T. SCHALLER. *J. Wash. Acad. Sci.* 9, 131–4(1919); cf. Zambonini, C. A. 12, 1448.—Three analyses of shattuckite establish the formula  $2\text{CuO} \cdot 2\text{SiO}_2 \cdot \text{H}_2\text{O}$ , whereas plancheite, as revized, is  $6\text{CuO} \cdot 5\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ . The  $n_s$  further preclude their being identical, new detns. by Larsen giving: shattuckite,  $\alpha = 1.752$ ,  $\beta = 1.782$ ,  $\gamma = 1.815$ ; plancheite,  $\alpha = 1.645$ ,  $\beta = 1.660$ ,  $\gamma = 1.715$ ; another sample,  $\alpha = 1.640$ ,  $\beta$  n. d.,  $\gamma = 1.715$ . It is suggested that Z.'s mineral was really shattuckite and not plancheite, or that his material if plancheite contained enough impurities to approximate the compn. of shattuckite. S. G. GORDON.

The pyritiferous deposit at the contact of the granite at Chizeuil, Saone-et-Loire, and its metamorphic rocks. A. LACROIX. *Bull. soc. franc. min.* 41, 14-21(1918).—The occurrence and associations of the rocks and their minerals are described. An analysis of andalusite by Pisani is given, and the properties of this and several other minerals are described. The rarest of these is svanbergite, which occurs in measurable crystals giving the usual forms and showing qualitatively the presence of Sr, Al,  $P_2O_5$  and  $SO_4$ . The course of the metamorphism resulting in the production of the rocks is discussed.

E. T. W.

The minerals of the grits of Segalas, Tunis. P. GAUBERT. *Bull. soc. franc. min.* 41, 33-8(1918).—This deposit contains an unusual number of heavy minerals, of which brief descriptions are given. It was found to be an easy matter to distinguish some of them by study under the microscope after melting in S.

E. T. W.

Some fashioned objects from Timbuctu. P. GAUBERT. *Bull. soc. franc. min.* 41, 38-40(1918).—By detns. of  $d$  and  $n$ , and by microchem. tests, amazonite and lazulite were recognized. Neither has as yet been found in place in Africa.

E. T. W.

A general summary of the mineral production of Canada during the calendar year 1917. JOHN MCLEISH. Can. Dept. of Mines, Mines Branch, Adv. Chapter, *Ann. Rept. on Mineral Production of Canada during 1917*, No. 499, 27 pp.(1919); cf. C. A. 12, 978.

E. J. C.

Deposits of gold in French colonies and particularly in Madagascar. A. LACROIX. *Rev. sci.* 56, 225-33(1918).—The deposits in Madagascar are described from the geologic and petrographic points of view. Statistics of the production and export of Au are given for the period 1902-1915.

L. W. RIGGS.

Oilology. A. PETERSON. *Oil & Gas J.* 17, No. 37, 40(1919).—In the Mid-Continent oil fields ocean currents flowed from the northeast to the southeast, carrying org. matter which was deposited at various points. Thus where the bed of the ocean formerly had been the oil will always be found and not necessarily always will there be domes or ridges. P. attempts to disprove the anticlinal theory, and does not believe there have been uplifts or faulting which allows lighter oil to filter up. The oil is found where it was originally produced from organic remains.

R. R. MATTHEWS.

Report on the Colorado coal field of Texas. N. F. DRAKE. Univ. Texas, *Bull.* 1755, 75 pp.(1917).—Seven analyses of coal, and one of clay, are given.

S. G. GORDON.

Texas granites. J. P. NASH. Univ. Texas, *Bull.* 1725, 8 pp.(1917).—Large deposits of gray, red and pink granite occur in Burnett, Gillespie, Llano, and Mason counties, Texas. Absorption tests and the compressive strength, and four analyses of the granites are given.

S. G. GORDON.

A spilitic facies of Lower Carboniferous lava-flows in Derbyshire. HENRY C. SARGENT. *Quart. J. Geol. Soc.* 73, 11-25(1918).—The lavas of Derbyshire, of Lower Carboniferous age, embrace rocks of spilitic and mugearitic types, and basalt, both having been derived from a common magma. These rocks are described, and analyses given.

S. G. GORDON.

Enstatite-dacite from the Figeac region and an enstatitic, feldspar-free lava, analogous to boninite, from Madagascar. A. LACROIX. *Bull. soc. franc. min.* 41, 43-52(1918).—Dacite from Figeac, Lot, France, is described petrographically, with analyses by Raoult of 2 different types. For comparison with type A analyses of 4 other similar rocks have been made: dacite from Mt. Pelee, eruption of 1902; that of the last eruption of Bandai San, Japan (after Wada); esterellite, Boulouris, Esterel, France; and hornblende-augite-hypersthene dacite from Antibes, Var, France. Type b

is compared with quartz-basalt from Martinique and norite from California. Cumbrante from Scotland also shows similar characters. A peculiar rock from Makobo, Madagascar, has also been analyzed by Raoult, and shows close resemblance to one of the above types, as well as to a hypersthene basalt from Mexico. It is also like boninite from Japan, but no accurate analysis of this is available for comparison.

E. T. W.

**The geology of Terrell County.** D. D. CHRISTNER AND O. C. WHEELER. Univ. Texas, *Bull.* 1819, 1-32(1918).—A physiographic and stratigraphic report. Three analyses of spring waters and one of well water are given.

S. G. GORDON.

**Geologic exploration of the southeastern front range of Trans-Pecos, Texas.** C. L. BAKER AND W. F. BOWMAN. Univ. Texas, *Bull.* 1753, 67-176(1917).—Chiefly stratigraphic. Four analyses of white Caballos novaculite (Devonian) are given.

S. G. GORDON.

Radioactivity and the coloration of minerals (NEWBERRY, LUPTON) 3. The assignment of crystals to symmetry classes (TUTTON), (WHERRY) 2. The classification of mimetic crystals (WHERRY, ADAMS) 2. The syn-crystallization of potassium and ammonium nitrates (CAILLART) 6. Determination of the principal indices of refraction of anisotropic substances (LEDoux) 2. Optical properties of magnesium chloroplatinate (GAUBERT) 2. Analyses of county limestone deposits (AMES) 15.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

**Economics of combustion in metallurgical operations.** M. ESCHER. *Stahl u. Eisen* 38, 977-82(1918); *J. Soc. Chem. Ind.* 38, 18A.—The dissoc. temp. of  $\text{CO}_2$  in presence of incandescent C, the temp. at which C and O combine to form CO, is  $1300-1400^\circ$  under practical conditions. It is the highest temp. obtainable by combustion of CO (producer gas), above which the monoxide and O co-exist uncombined; but combination takes place as soon as the temp. falls below the dissoc. point. Higher temps. are attained by the combustion of C, H, or hydrocarbons. In open-hearth furnaces fired with producer gas, in which the charge melts at about  $1300^\circ$ , CO does not contribute to the raising of the temp. beyond that point and after this temp. is reached combustion of the CO takes place only in the regenerators. Only the H and hydrocarbons present in the producer gas are of value for raising the temp. further. Hence the vol. of gas blown in must be increased. The most economical manner of working would consist in melting down the metal with producer gas and finishing the charge with a gas rich in hydrocarbons. In cupola furnaces, the O-CO mixt. is formed at the tuyères, and combination to  $\text{CO}_2$  takes place higher up in the shaft in contact with the cooler charge. Where  $1300-1400^\circ$  has to be exceeded in foundry work, the most economical appliance would be a cupola with an upper and lower set of tuyères. The Fe would be melted down in the zone above the upper tuyères; in the lower part, where the furnace works as a gas-producer, the molten metal would become superheated.

E. J. C.

**Electrical valve control.** ANON. *Eng. Mining J.* 107, 411-2(1919).—A description of the application of the Dean valve control system to large blast furnace air valves. The feature of the system is that instead of the automatic cutoff of the power occurring before closing and depending on drift to close the valve, the gate is seated home and then the gears are thrown off. In this way the motor cannot jam the gate by its momentum. The system may be applied to any ordinary gate valve.

W. L. BADGER.

Cobalt, molybdenum, nickel, titanium, tungsten, radium, uranium and vanadium in 1916. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1916, Part I, 775-807 (preprint No. 25, published Feb. 25, 1919). E. H.

The value of sulfur in ores, with special reference to blende-roasting contracts. R. PAUL. *Metall u. Ers* 15, 371-86 (1918); *J. Soc. Chem. Ind.* 38, 18A.—In high-grade sulfides (e. g., pyrite) S. has a positive value, while the contrary is the case with medium- and low-grade sulfide ores. Values of S in Spanish pyrite are given. By calcg. the cost and profits of  $H_2SO_4$  manuf., the value of the S in blende was also worked out. The value of S in blende is lower than that of S in pyrite, due chiefly to the higher working-cost, as blende must be dead-roasted, while pyrite is less thoroughly calcined with a view to a large output in acid. E. J. C.

Zinc content of furnace ashes. O. MÜHLHAUSER. *Metall u. Ers* 15, 259-65 (1918); *J. Soc. Chem. Ind.* 37, 626A.—The Zn content of the ashes from the muffles varied from 2.9 to 14.5%, the total loss being on the av. about 10%. The ashes near the throat of the muffle contd. about 35% Zn, compared with an av. of just over 4% in the hinder part. The Zn present varied from 2.9 to 57% along the whole length of the muffle, due chiefly to the lower temp. at the throat, but also to the deposition of Zn oxide formed by the action of air entering between the muffle and the condenser. The Zn content of the ash increases but slowly at first from 3 to 6% over a distance of 105 cm. from the rear end of the muffle, finally rising rapidly in the last 20 cm. of the muffle. The Zn is present in the ashes chiefly as oxide and sulfide; if Fe is present the latter is reduced to metal. E. J. C.

Zinc slags. O. MÜHLHAUSER. *Metall u. Ers* 15, 303-5 (1918); *J. Soc. Chem. Ind.* 37, 658A.—The amt. of slag formed in the retorts during distn. should be small, and its compn. should be controlled by mixing the charge in suitable proportions so that it has as little action on the retort as possible. An av. slag sample obtained by distg. a mixt. of Joplin and Wisconsin ores was found to have an O ratio of 1:2.8, approaching that of a trisilicate. It was very viscous at distn. temps. and formed an internal coating, the thickest part of which was on the bottom of the retort. The latter was thus protected from corrosion, and the loss of Zn by vapor diffusion decreased. E. J. C.

Glazes on zinc retorts. O. MÜHLHAUSER. *Metall u. Ers* 15, 393-5 (1918); *J. Soc. Chem. Ind.* 38, 42A.—When Zn distg. furnaces are heated with coal rich in Fe, the volatile matter and dust from the fuel may attack the retorts and interior of the furnace, forming glaze-like materials which eventually collect into drops. If the glaze falls from one retort on to a lower one it may cause extensive erosion. Analyses of several "glazes" are given. Their compn. varies with the fuel and the conditions in the furnace. The "glazing" of the retorts is advantageous, as it restricts loss due to diffusion of Zn vapor through the wall of the retort; hence natural gas and Mond gas appear to be undesirable fuels, because their freedom from flue-dust precludes the formation of "glazes." These gases might be utilized, however, if a suitable artificially prepd. glaze could be applied to the retorts. E. J. C.

Extraction of mercury from its ores by sodium sulfide. C. H. HOLLAND. New Zealand. *J. Sci. Tech.* 1, 153-4 (1918); *J. Soc. Chem. Ind.* 37, 548A.—One part of an ore contg. cinnabar,  $Fe_2O_3$ , and a hydrocarbon is crushed, and agitated with 4.5 parts of an aq. soln. contg. 4% Na sulfide and 1% NaOH. The soln. is filtered and Hg is pptd. from the double sulfide of Hg and Na by Al shavings. The Hg is obtained partly in metallic form, and partly as a powder mixed with foreign matter, which is heated in a retort with  $MnO_2$  and lime. The total yield of Hg is 84.5%. E. J. C.

**Blast furnace treatment of low grade manganese ores.** R. CORDES. *Stahl u. Eisen* 37, 494-7(1917); *Rev. métal.* 15, Extraits, 310-2(1918).—Low-grade carbonate ore from the Siegerland district is hand-picked, or concd. by an electromagnetic process. The value of the concentrate as a source of Mn is the smaller the higher its  $\text{SiO}_2$  content. In smelting for pig-iron contg. 3.5-4% Mn, the slag normally takes up 3% Mn; hence the Mn content of the metal decreases as the quantity of slag increases. Ore of the best quality assays  $\text{SiO}_2$  10, Fe 48, and Mn 9%; ores contg. more than 30%  $\text{SiO}_2$  must be concd. E. J. C.

**Impurities in and purification of commercial aluminium.** ANON. *Ber. Physik.-Techn. Reichsanstalt* 1917; *Stahl u. Eisen* 38, 1044-5(1918); *J. Soc. Chem. Ind.* 38, 17A.—The impurities in 4 samples of com. metal varied from 0.4 to 2%. These were chiefly Fe and Si, with lesser amts. of C and traces of S, P and N. The analytical methods for detg. the impurities are as yet imperfect. The bulk of the Al may be eliminated as chlorine by satg. the acid soln. with HCl. The purification of the com. metal is difficult; Si may be largely removed by fusion with niter, but not the Fe. The bulk of the latter can be dissolved by digesting the metal with 2% HCl; borings contg. 1% Fe gave 60% of purified metal with less than 0.1% Fe. E. J. C.

**Melting of gray iron in an oil-fired furnace.** K. ABEKING. *Stahl u. Eisen* 38, 792-5(1918); *J. Soc. Chem. Ind.* 37, 624A.—A. describes the production of gray iron castings of special quality in furnaces of the oil-fired "drum" pattern without a crucible. The first cost of an installation for  $\frac{1}{2}$  ton melts is given as M. 5000-6000 (\$1,190-1,428). The furnace, which takes up little room and is equally satisfactory for other metals than Fe, is much more costly to run than a cupola. The iron can be run in a very fluid condition for thin castings, and less labor is required than for a cupola. The tensile strength of the cast Fe ranges from 21.7 to 30 kg. per sq. mm. The total C may vary from 2.45 to 3.26%, and the S from 0.062 to 0.12%. The Brinell hardness of the Fe varies from 160 to 180. The charge used consists of 5-10% of steel scrap, 20% of hematite Fe, and the rest foundry irons. The Si loss during melting reaches 15-20%. The av. heat lasts 2 hrs. E. J. C.

**Utilization of ash of pyrites in Italian steel making.** ALFREDO LOTTI. *Follonica. Bollettino del comitato centrale di mobilitazione industriale* 12, 196FF(1918); *Met. italiana* 10, 242-7(1918).—The ash is the residue from washings of pyrites in production of  $\text{H}_2\text{SO}_4$  and superphosphate. It constitutes more than half the wt. of the original pyrites. The 3 principal factors hindering the use of the ash are impurities in the ash (considering the ash as an Fe ore), distance from the metallurgical centers of utilization, and physical state of aggregation. The compn. of an av. sample of ash is as follows: insol. residue 11.60%,  $\text{Fe}_2\text{O}_3$  79.96 (= 55.93 Fe),  $\text{Al}_2\text{O}_3$  5.28,  $\text{SO}_3$  3.43 (= 1.37 S), ZnO. 0.64%. The S occurs as sulfide and sulfate, chiefly as basic Fe sulfate and  $\text{CaSO}_4$ . It is more harmful when combined with the Fe. As sulfide it passes directly into the pig Fe during reduction of the ore, and also as basic sulfate, being first reduced to sulfide.  $\text{CaSO}_4$  is not harmful, changing to sulfide and thence passing into the slag. It is important to reduce the amount of S contained in pyrites ash. The powdery or granular portion of the ash offers obstacles in the way of its utilization. This may be overcome by some form of agglomeration with binders or by fusion, with partial desulfurization in each case. ROBERT S. POSMONTIER.

**Influence of badly burnt lime in the basic steel process.** M. BACKHEUER. *Stahl u. Eisen* 38, 748-50(1918); *J. Soc. Chem. Ind.* 37, 547A.—Lime for slag making in the basic process should give a loss on ignition of not more than 2-4%, or at the highest 6%. Dead-burnt lime, however, is dissolved with difficulty in the slag. Badly burnt lime exercises a harmful influence both on the quality of the steel, resulting in non-

metallic inclusions, and also on the working of the heats as a result of the chilling effect. In the basic Bessemer process poor lime results in an excessive loss of Mn, the steel being highly oxidized. The blow is abnormal and the elimination of P in the after-blow uncertain. With badly burnt lime 1.3% Mn is the minimum necessary in the mixer-Fe used. Excessive loss during the blow and considerable production of scrap also result from the addition of incompletely burnt lime. E. J. C.

**Metals and alloys from a colloid chemical viewpoint.** JEROME ALEXANDER. *Bull. Am. Inst. Mining Eng.* 1919, 602-3.—Metals and alloys are compared to jellies or sponge-like structures having very great stiffness at ordinary temps.; the dispersion of their constituent phases depends upon chem. compn., mutual soly., speed of chilling, subsequent mechanical and heat treatment, "protective" action or crystal inhibition, etc. The use of the ultramicroscope is urged to develop the cause of the structure revealed by ordinary metallographic pictures. Analogies are drawn between metals and transparent soap, gold ruby glass, etc. JEROME ALEXANDER.

**Examination of metals by X-rays.** H. PILON. *J. Röntgen Soc.* 14, 17(1918).—A number of radiographs are given illustrating the application of X-rays to the examn. of metals by means of Collidge tubes and specially designed app. The radiographs demonstrate the faulty welding of an Fe tank, the rays passing through 20 mm. thickness of Fe, a fault in the Al gear case of an aircraft engine, where air holes in the Al had been filled with an alloy of greater density, etc. F. P. PHELPS.

**The Curie point in pure iron and in ferro-silicon.** A. SANFOURCHE. *Compt. rend.* 167, 683-5(1918).—At about 1280° Fe undergoes a transformation with respect to its magnetic properties and this is referred to here as the Curie or A<sub>1</sub> point. Recently this transformation has been detected by different investigators at varying temps. so that it seemed desirable to work with very pure materials to det. exactly where the change takes place normally. With such a material, the transformation was detected at 1310° on cooling and at 1365° on heating. Very pure, crystallized Si was then added to the Fe and it was found that the transformation took place at a lower temp. With 2% and with 2.5% Si, the A<sub>c</sub> temp. was at 1297° and the A<sub>r</sub> temp. was at 1225° and 1195°, respectively. W. T. H.

**A metallographic investigation of transverse fissures with special reference to high phosphorus streaks.** G. F. COMSTOCK. *Bull. Am. Inst. Mining Eng.* 1919, 598-602; cf. C. A. 13, 226.—In discussing the paper, James E. Howard points out that transverse fissures may be the result of fatigue, grade of steel, or mill practice. He places particular emphasis upon the fatigue of the steel and belittles any attempt to place the blame entirely upon the presence of microscopic flaws. The intense internal strains which develop in the use of rails make it seem probable that service conditions have reached that stage in which the ability of steel to withstand them has nearly reached its limit. W. T. H.

**A comparison of grain-size measurements and Brinell hardness of cartridge brass.** W. H. BASSETT AND C. H. DAVIS. *Bull. Am. Inst. Mining Eng.* 1919, 607; cf. C. A. 13, 307.—In the discussion of the paper W. R. Hibbard states that the technical dept. of the Am. Brass Co. has discarded grain measurements and relies upon Brinell detns. as a guide to the serviceability of cartridge brass of 0.1 in. gage or more. W. T. H.

**The premature rupture of pieces of steel subjected to repeated shocks.** CH. FRÉMONT. *Compt. rend.* 168, 54-6(1919).—In order that a piece of metal which is subject to alternating stresses and strains shall not deteriorate, it is necessary that the quantity of work borne by each part shall be absorbed elastically and that at no moment shall there be a strain or stress above the elastic limit of that part. On the

basis of such a theory it has been found possible to increase the life of axles of railroad cars, etc., by modifying the design of the material. The weakness of material is usually due to lack of homogeneity and it is pointed out that evidence of trouble caused by slag lines was noted by Piobert in 1836.

W. T. H.

**Corrosion of brass in sea water.** PAUL T. BRUHL. *Chem. Met. Eng.* 20, 239 (1919).—A general discussion of the influence of various corrosion products on the rate of corrosion.

W. T. H.

**A technical study of acid-Bessemer steel.** RICHARD S. MCCAFFERY. *Iron Age* 103, 626-7(1919).—From chem. examination of samples taken at various stages of work in the Bessemer converter, important conclusions regarding the changes that take place during the "acid Bessemer blow" have been drawn. During the "blow," FeSi burns first, forming  $\text{Fe}_2\text{O}_3$  and  $\text{SiO}_2$  and, as a result of the large amt. of heat liberated, the temp. rises.  $\text{Mn}_2\text{C}_3$  should be the next to burn to form MnO and  $\text{CO}_2$ . The  $\text{Fe}_2\text{O}_3$ , MnO and  $\text{SiO}_2$  unite to form an Fe-Mn-SiO slag. The temp. continues to rise and the  $\text{Fe}_2\text{C}$  begins to be oxidized. When nearly all the C has been acted upon, the Bessemer converter is ready to be turned down and its contents poured, at a temp. of 1600-1700° under normal conditions. Under these conditions no trouble is experienced. If, on the other hand, the temp. of the converter becomes too high, possibly because too much FeSi was in the pig Fe,  $\text{Mn}_2\text{Si}_3$  may begin to burn after the FeSi has been oxidized and while  $\text{Mn}_2\text{C}_3$  is left in the molten metal. This begins to cause trouble by reducing  $\text{Fe}_2\text{O}_3$  and  $\text{SiO}_2$ , making the slag more basic and making it possible to form some ferrite slag. The slag becomes less fusible and "spitting" ensues. This continues until all the  $\text{Mn}_2\text{C}_3$  has been eliminated. The  $\text{Fe}_2\text{C}$  then oxidizes and when sufficiently acted upon the blow is finished. The reaction  $2\text{Mn} + \text{O}_2 = 2\text{MnO}$  does not appear to be reversible in the converter. By steaming during the Si blow, the temp. can be kept low so that the  $\text{Mn}_2\text{C}_3$  is oxidized early in the operation without exerting any harmful effect. Certain observations indicate that  $\text{CO}_2$  rather than CO may be formed during the burning of the  $\text{Fe}_2\text{C}$ . By using a new converter bottom with increased no. of tuyères distributed in a new manner a large saving in time and power was effected. The blast pressure was reduced with the new converter bottom and air was not wasted in burning C to CO.

W. T. H.

**Metallographic examination of tinplate.** LEO MAYER. *Stahl u. Eisen* 1918, 960-2; *Engineering* 107, 150(1919).

W. T. H.

**Strength of solders at elevated temperatures.** C. W. HILL AND C. H. CARPENTER. *Metal Ind.* 17, 82(1919).—Cu cylinders of 0.5 in. bore were soldered together end to end in such a way that 0.005-0.05 in. of solder was between the 2 cylinders. The tensile strength of the joints was then tested at temps. ranging from 20° to 1400°. The solders used were (1) "half and half," (2) pure Sn, (3) a special solder composed of 90.6 Pb, 7.9% Cd, 1.5% Zn. The breaking strength fell off steadily as the temp. was raised. At 20° the joints showed a breaking strength of 11,000 to 12,000 lbs. per sq. in., but at 1400° the first solder had practically no strength, the second solder broke at 3,000 lbs. per sq. in. and the third at 6,000 lbs. per sq. in.

W. T. H.

**Solders for aluminium.** ANON. *Bureau Standards Circ.* 78(1919).—All metals used for soldering Al are electrolytically negative to Al and the joint is subject to rapid corrosion. Unless very heavy, so that surface corrosion is unimportant, all soldered joints should be protected. The solders are best applied without flux after preliminary cleaning and tinning of the surface. The solder should consist of a Sn base with additions of Zn or Zn and Al. The higher the temp. of tinning, the better is the adhesion. The tensile strength of a good joint is about 7,000 lbs. per sq. in.

W. T. H.

**Welding mild steel.** H. M. HOBART. *Bull. Am. Inst. Mining Eng.* 1919, 517-61. —In connection with emergency ship building during the war, welding has replaced



riveting to a considerable extent. Results are recorded here of a great many expts. which were performed in the study of the various methods of making welds and methods for testing them. The adequacy of welding as a substitute for riveting may be regarded as demonstrated by actual practice in ship-building. W. T. H.

A comparison between American and British practice in electric welding. S. V. GOODALL. *Engineering* 107, 254-6(1919).—Americans favor spot welding for bracket connections while the British prefer rivetting. For right-angled water-tight connections, Am. practice tends to heavy welding, the British to rivetting, or to notch angles with light intermediate rivetting. In England, welding is not applied to mild steel plates of greater thickness than the 25 lb. plates but no such limits have been set in the U. S. W. T. H.

Oxy-acetylene welding. J. H. DAVIES. *Engineering* 107, 169-70(1919).

W. T. H.

The development of the oxy-acetylene welding and cutting industry in the United States. HENRY CAVE. *Engineering* 107, 170-3(1919).

W. T. H.

Determining the allotropic transformation of nickel (JANEČEK) 2. Rupture of cast iron in contact with mixed acid (CUMMING) 24. Examination of drilling oils and their substitutes (MARCUSSE) 22. Electrostatic precipitation (BRALBY), (ESCHOLZ) 4. Electric precipitators (THUM) 4. The Cottrell electrostatic recovery process (BUSH) 4. Electric precipitation of fumes (MICHEL) 4.

DESCH, C. H.: Introductory Lecture to the Classes in Metallurgy in the Royal Technical College, Glasgow. Session 1918-19. Glasgow: J. Maclehose & Sons.

JINZES, W. H.: *Ijzer, Kool en Zuurstof. Een eenvoudige Leerboek voor Ambachtsonderwijs en zelfstudie.* 2nd Ed. Deventer: A. E. Kluwer. 84 pp. f 1.25. For review see *Chem. Weekblad* 16, 184(1919).

Ore-concentrator and amalgamator. E. B. BENNETT. U. S. 1,292,684, Jan. 28.

Sintering ores. A. H. RICHARDS. U. S. 1,292,059, Jan. 21. Ore to be sintered is formed into a layer, the top surface of the layer is ignited, a draft is passed downwardly through the ore to carry the burning zone gradually through the layer and a second layer of ore is deposited on the first layer when the burning zone has penetrated the first layer to a suitable distance.

Amalgamator for treating ores. J. GARSIDE. U. S. 1,292,753, Jan. 28.

Recovering metals from ores. R. GAHL. U. S. 1,291,824, Jan. 21. Ores of Cu or other metals are deslimed, subjected to a flotation treatment to produce a middling product and the latter and also the tailings are leached to obtain a metalliferous soln., after the middling product is roasted. The method is especially adapted for treatment of porphyry Cu ores.

Extracting values from manganese ores. E. W. HASLUP and B. A. PRACOCK. U. S. 1,291,867, Jan. 21. Finely divided ore containing Mn and other metals which are attacked by  $H_2SO_4$ , such as K, Al, Zn, Ni, Co, Cu or W, is treated with concd.  $H_2SO_4$  and the reaction of the acid on the constituents of the ore is allowed to proceed in a closed vessel until the mixt. attains a temp. above  $100^\circ$  and substantially all the Mn and other values have been converted into sulfates. The latter are then extd. from the mass and Mn values may be recovered from the soln. thus obtained by pptn. and fractional sepn. Cf. C. A. 12, 567.

Hydrometallurgy of copper. W. N. ROSSBERG and G. E. SHERIDAN. U. S. 1,292,075, Jan. 21. Cu is recovered from oxidized ores by leaching with  $H_2SO_4$  to ob-

tain a soln. of  $\text{CuSO}_4$ , the Cu is pptd. from the soln. as  $\text{Cu}_2\text{S}$  in the presence of  $\text{SO}_2$  by the addition of  $\text{H}_2\text{S}$ , and the acid soln. regenerated by this last procedure is used for leaching additional quantities of ore and for decomposing sulfide to produce  $\text{H}_2\text{S}$  for further use in the process.

**Reducing iron in blast furnaces.** H. B. WEAVER and J. GAYLEY. U. S. 1,292,937, Jan. 28. In operating blast furnaces, the process is carried on to produce Fe and slag as usual and to produce by a heated air blast, supplied under pressure, an atm. of reducing gas in contact with the ignited fuel. Such portions of the reducing gases are withdrawn from the furnace as are not necessary for maintaining the required reducing conditions in the stack, and *compds. of alkali metals* are extd. from the gases so withdrawn. The withdrawal may take place intermittently to permit accumulation of alkali metal carbonate between the periods of withdrawal.

**Pure iron.** R. K. MUENCH. U. S. 1,292,630, Jan. 28. The pat. relates to the obtainment of pure Fe from  $\text{FeCl}_3$  solns. containing impurities, such, *e. g.*, as the liquor obtained by pickling Fe with HCl, or a soln. especially prepd. for the purpose by dissolving impure Fe in HCl. The soln. is evapd. to expel any excess of acid present, care being taken so far as possible not to permit oxidation.  $\text{K}_4\text{Fe}(\text{CN})_6$  is added to ppt.  $\text{K}_2\text{Fe}(\text{CN})_6$ , the ppt. is filtered out and, while still moist, is treated with somewhat more than a combining proportion of HCl with respect to the amt. of Fe present. Concd. solns. are used. The ppt. and HCl are heated together with addition of  $\text{H}_2\text{O}$  (after preliminary evapn. nearly to dryness) and the mixt. is boiled for 1 hr. to obtain a soln. of  $\text{FeCl}_3$  which is substantially pure except for alkali metal *compds.* This soln. may be electrolyzed to obtain pure Fe or may be oxidized, treated with a precipitant to obtain  $\text{Fe}(\text{OH})_3$  and the latter may be ignited and the oxide so obtained reduced by H.

**Melting readily oxidizable metal scrap.** J. COULSON. U. S. 1,292,582, Jan. 28. Turnings of magnalium or other readily oxidizable metal, in subdivided form to be melted, is heated in a melting chamber (while excluding air and adding the metal in small portions) with a small amount of Ca Al silicide as a deoxidizing agent.

**Apparatus for continuously sherardizing small metal articles.** H. C. HARRISON. U. S. 1,291,866, Jan. 21.

**Carburizing material.** G. W. PRESSL. U. S. 1,292,044, Jan. 21. A dry packing material for carburizing metals is prepd. by carbonizing coconut shells in a retort and treating the carbonized material, while at a temp. near to that of distn., with an aq. soln. of  $\text{Na}_2\text{CO}_3$ .

**Annealing copper and brass tubes.** J. A. MOORHEAD. U. S. 1,292,352, Jan. 21. Tubes of Cu or brass are bright-annealed by passing them through a tubular furnace of refractory material heated by an a. c. primary coil.

**Core compound.** J. S. ROBESON. U. S. 1,292,068, Jan. 21. An adhesive suitable for use in making sand cores for founding is formed of rosin size and desiccated waste sulfite liquor, with or without petroleum or other oils.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

**Esterification in aqueous solution.** ATTILIO PURGOTTI. Portici. *Gazz. chim. ital.* 48, II, 58-62 (1918).—P. carried out expts. in order to det. whether esterification takes place in very dil. aq. solns., to what extent it takes place and if it is influenced by the addition of various *compds.*, especially acids. AcOH and EtOH were mixed

in mol. proportions, and 50 cc. portions, with 100 cc.  $H_2O$  and 0.1  $N$   $HCl$ , resp. 10 cc. samples were removed and titrated for  $AcOH$  at 24-hr. intervals. The results showed that esterification in aq. soln. takes place to a very slight extent and reaches equil. with the esterification of about 1.2%  $AcOH$ . The addition of  $NaCl$  to the soln. accelerates and increases the esterification and equil. is reached at 7%. The addition of  $HCl$  and  $H_2SO_4$  accelerates and increases the esterification considerably which now reaches equil. quite quickly with 19% esterified. The addition of more acid increases the velocity of esterification still more but the final equil. comes with 19% esterified.  $NaCl$  in the same solns. increases and accelerates the esterification much as shown by the sepn. of the ester as a sep. layer and reaches equil. with 45% esterified. By diminishing the amt. of  $H_2O$  in an expt. using 60 g.  $AcOH$ , 50 g. 90%  $EtOH$ , 100 cc. satd.  $NaCl$  soln. and 20 g. concd.  $H_2SO_4$ , 55-60 g. pure  $AcOEt$  or a 70% yield was obtained.  $HCl$  and  $H_2SO_4$  accordingly act as catalysts. Additional expts. in which satd.  $NaCl$  to the extent of 1.5 times the original vol. of the  $AcOH$ - $EtOH$  mixt. was added as well as various acids and org. compds. showed the following: The catalytic power of the acids is of the same order as their dissociation consts. The acid salts like  $KHSO_4$  have a catalytic action. The org. acids also act as catalysts. Their action is slow at ordinary temp. but is quite rapid at 35° except  $(CO_2H)_2$ , which behaves nearly like an inorg. acid. Their catalytic power is of the same order as their degree of dissociation. Gallic and tannic acids retard the esterification so that it is slower than when only  $NaCl$  is used.  $K$  acid tartrate acts anticatalytically as shown also by its ability to retard the esterification with  $(CO_2H)_2$ . The catalytic effect is not limited to the carbonyl group as shown by the fact that the phenols catalyze this esterification. The most active was picric acid, next the cresols in the order, *m*-, *o*- and *p*-; *o*-, *m*- and *p*- $C_6H_4(OH)_2$  are less active than phenol and the tri- $HO$  compds. (phloroglucinol, pyrogallol) behave like gallic and tannic acids.

E. J. WITZEMANN.

$\alpha$ -,  $\beta$ -, and  $\gamma$ -Trinitrotoluenes. HUGH RYAN AND W. M. O'RIORDAN. Univ. College, Dublin. *Proc. Roy. Irish Acad.* 34B, 175-93 (1918).—Crude  $\alpha$ -trinitrotoluene is liable to contain small quantities of its  $\beta$ - and  $\gamma$ -isomers. Accidents which have occurred may be due to the presence of sensitive compds. of any one of the 3 isomers. In view of such a possibility this work was undertaken in order to det. the behavior of these isomers towards alkalis, amines, hydrocarbons, and aldehydes and the behavior of alkalis towards *sym*- $C_6H_3(NO_2)_3$ . A very thorough history of previous work done on the reaction of these reagents with the 3 isomers is given. When *sym*- $C_6H_3(NO_2)_3$  was heated with 5%  $NaOH$ ,  $NH_3$  was evolved and a dark solid formed. Extn. with  $C_6H_6$  and recrystn. from alc.- $Me_2CO$  yielded tetranitroazoxybenzene, m. 185°, sol. in  $C_6H_6$ ,  $Me_2CO$ , and alc. In  $Me_2CO$  it gave a violet color with  $NaOH$ , decolorized by  $HCl$ . Dil.  $NaOH$  reacted similarly with *sym*- $C_6H_3(NO_2)_3$ ; 5%  $Na_2CO_3$  reacted more slowly.  $BuONa$  with  $\alpha$ - $MeC_6H_3(NO_2)_3$  yielded a red solid, probably  $MeC_6H_3(NO_2)_3NaOBu$  (8.3%  $Na$ ; theory 7.1; discrepancy probably due to the presence of a dialcoholate). This compd. exploded when heated over a Bunsen flame or when dropped into a tube heated to 170°.  $\alpha$ - $MeC_6H_3(NO_2)_3$  reacted with  $KOH$  in the presence of  $I_2$  to form hexanitrodibenzyl, colorless, prismatic needles from  $C_6H_6$ , m. 210-3°. The same compd. was obtained by the reaction of  $Na_2CO_3$  and  $NaOH$  on  $\alpha$ - $MeC_6H_3(NO_2)_3$ ; it m. 216-7° (decompn.), is sol. in boiling  $C_6H_6$  or xylene and gives a red color with  $Na$ - $Hg$  and alc. and a brownish red color with  $NaOH$ . Although similar in properties, this compd. was shown not to be tetranitroazoxytoluene by prep. the latter by the method of Anschütz and Zimmerman (*C. A.* 9, 1062), and comparing the properties of the two. In an attempt to prep. hexanitrodibenzyl, dibenzyl was first prepd. by the reaction of  $Na$  with  $PhCH_2Cl$ . Nitration with  $HNO_3$ ,  $H_2SO_4$  and  $KNO_3$  yielded, however, 2,4,2',4'-tetranitrodibenzyl, colorless prisms from

$C_6H_6$ , m.  $165^\circ$ , gives a red color in alc. with Na amalgam. Attempts at further nitration failed.  $\beta$ - $MeC_6H_4(NO_2)_3$  dissolved almost completely in NaOH. Upon acidifying the soln., dinitro-*m*-cresol (Will, *Ber.* 47, 712(1914)) was obtained by crystn. from dil. alc., m.  $101^\circ$ .  $Na_2CO_3$  yielded the same results. The portion insol. in alkali exploded when heated. Both  $Na_2CO_3$  and NaOH probably yielded a dinitro-*m*-cresol, m.  $72-3^\circ$ , when heated with  $\gamma$ - $MeC_6H_4(NO_2)_3$ . From the portion insol. in alkali were obtained acicular crystals, m.  $190^\circ$ , which gave, in alc., a greenish yellow color with  $NH_3$  and was possibly a dibenzyl or stilbene deriv.  $NH_3$  reacted with  $\alpha$ - $MeC_6H_4(NO_2)_3$ , forming a dark brown amorphous residue which exploded on heating. The  $NH_3$  soln. gave a brown amorphous ppt. with acid.  $\beta$ -Dinitrotoluidine, m.  $95-6^\circ$  from alc., was obtained as a yellow solid by the action of alc.  $NH_3$  on  $\beta$ - $MeC_6H_4(NO_2)_3$ . Hepp's results (*Ann.* 215, 344) imply that this could occur only in a sealed tube. In alc. the dinitrotoluidine gave a bright red color with NaOH, turning crimson when warmed. The same dinitrotoluidine as above was obtained by the action of  $NH_3$  alone on  $\beta$ - and  $\gamma$ - $MeC_6H_4(NO_2)_3$ . When the  $NH_3$  soln. was acidified a slight brown ppt. occurred in each case.  $\alpha$ - $MeC_6H_4(NO_2)_3$  formed an additive compd. with *p*-toluidine, m.  $68-70^\circ$  (Jackson and Clarke, *Proc. Chem. Soc.* 1906, 83).  $\beta$ - $MeC_6H_4(NO_2)_3$  reacted readily with  $PhNH_2$ , yielding a dinitrotolylphenylamine, prismatic crystals, m.  $114-5^\circ$ .  $\beta$ - $MeC_6H_4(NO_2)_3$  with *p*-toluidine formed a dinitroditylamine, red prisms from alc., m.  $131^\circ$ .  $\gamma$ - $MeC_6H_4(NO_2)_3$  with *p*-toluidine formed an additive compd., yellow crystals, m.  $147^\circ$ , readily converted into a dinitroditylamine, orange solid, m.  $154^\circ$ . Thus Hepp's statement that  $\gamma$ - $MeC_6H_4(NO_2)_3$  does not form additive compds. with amines is incorrect.  $\alpha$ - $MeC_6H_4(NO_2)_3$  reacted readily with  $BzH$ , anisaldehyde, and piperonal on the  $H_2O$  bath in the presence of piperidine, forming, resp.: 2,4,6-trinitrostilbene, 2,4,6-trinitro-4'-methoxystilbene, and 2,4,6-trinitro-3',4'-methylenedioxy-stilbene (dull, yellow prisms, from  $C_6H_6$ , becoming scarlet upon losing  $C_6H_6$  of crystn.; scarlet substance, m.  $156-7^\circ$ ). Neither the  $\beta$ - nor the  $\gamma$ -isomer underwent such a transformation even at  $130^\circ$ . Phenanthrene with  $\alpha$ - $MeC_6H_4(NO_2)_3$  yielded an additive compd., bright yellow needles, m.  $98-9^\circ$ , sol. in  $C_6H_6$ ,  $Me_2CO$ ,  $Et_2O$ , or glacial  $AcOH$ ; forms a violet soln. in  $C_6H_5N$ . This compd.,  $MeC_6H_4(NO_2)_3 \cdot C_{10}H_7$ , is not decompd. by alc.,  $HCl$  or  $AcOH$ ; decompd. by NaOH, giving a violet color. Phenanthrene with  $\beta$ - $MeC_6H_4(NO_2)_3$  formed an additive compd.,  $C_{20}H_{13}N_3O_6$ , pale yellow plates from alc., m.  $105^\circ$ , sol. in  $C_6H_6$ ,  $Et_2O$ , or glacial  $AcOH$ ; decompd. by NaOH.  $\gamma$ - $MeC_6H_4(NO_2)_3$  also formed an additive compd. with phenanthrene,  $C_{20}H_{13}N_3O_6$ , dull, yellow prisms from alc., m.  $83^\circ$ , which otherwise resemble the deriv. of the  $\beta$ -isomer. The results show that although the 4 substances examd. all react differently with alkalis, in each case a reduction process occurs as shown by evolution of  $NH_3$ . The formation of an amine may be the first step in the reduction, the  $NH_2$  group being then replaced by  $OH$  with evolution of  $NH_3$ , following which reduction phenolic substances of a complex nature are formed. In the case of  $\alpha$ - $MeC_6H_4(NO_2)_3$ , oxidation occurs simultaneously with the reduction, hexanitrodibenzyl being formed. Only *s*- $C_6H_4(NO_2)_3$  yields a tetranitro-azoxy compd. In most cases dark substances insol. in alkali were formed and these exploded on being heated. The action of amines on the 3 trinitrotoluenes proceeds differently in the 3 cases. The additive compd. formed by the  $\gamma$ -isomer with *p*-toluidine contradicts Hepp's statement that this does not occur.  $\alpha$ - $MeC_6H_4(NO_2)_3$  is the only one of the trinitrotoluenes from which stilbene derivs. were obtained by the reaction of aldehydes. A significant fact in connection with the statement made in the beginning regarding the presence of sensitive compds. in the trinitrotoluenes is that a sample of crude  $\gamma$ - $MeC_6H_4(NO_2)_3$  was found to contain a dark, amorphous substance which exploded on heating.

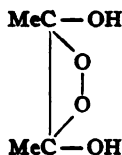
C. H. KIDWELL.

Action of nitric acid and nitrous acid on diphenylamine. HUGH RYAN AND PHYLLIS RYAN. Univ. College, Dublin. *Proc. Roy. Irish Acad.* 34B, 194-204(1918).

—The products of the action of low concns. of  $\text{HNO}_3$  on  $\text{Ph}_2\text{NH}$  and  $\text{Ph}_2\text{NNO}$  were detd. in order to approximate conditions actually existing in a nitrocellulose explosive. The action of 1 mol. of  $\text{HNO}_3$  on  $\text{Ph}_2\text{NH}$  in glacial  $\text{AcOH}$  formed only the nitrate of the base; 2 mols. of  $\text{HNO}_3$  converted part of the amine into a brown, resinous solid, part into a yellow, oily solid, m.  $135-40^\circ$  (crystd. from alc. and  $\text{CHCl}_3$ ). 3 mols. of  $\text{HNO}_3$  also yielded the brown, resinous solid and from a similar yellow, oily solid  $[2,4-(\text{NO}_2)_2\text{C}_6\text{H}_3]_2\text{NH}$  (a) was crystd. from  $\text{Me}_2\text{CO}$ . 4 mols. of  $\text{HNO}_3$  yielded both the brown, resinous solid and the yellow solid. That part of the latter which was insol. in  $\text{CCl}_4$  was (a), m.  $198-200^\circ$  (crystd. from  $\text{Me}_2\text{CO}$  and alc.). The portion sol. in  $\text{CCl}_4$ , m.  $156-9^\circ$ , was  $(\text{NO}_2\text{C}_6\text{H}_4)_2\text{NNO}$ . 6 mols.  $\text{HNO}_3$  rapidly formed the brown solid which was filtered off; the yellow solid obtained from the filtrate by pptn. with  $\text{H}_2\text{O}$  was washed with  $\text{CHCl}_3$ . The portion insol. in  $\text{CHCl}_3$  was recrystd. from boiling xylene, and identified as (a). Evapn. of the  $\text{CHCl}_3$  ext. and treatment with  $\text{CCl}_4$  yielded  $(p\text{-NO}_2\text{C}_6\text{H}_4)_2\text{NH}$ , yellow crystals, m.  $210^\circ$  (uncor.), and unidentified orange crystals, m.  $195^\circ$ . The brown resinous solids did not melt below  $280^\circ$ , were nearly insol. and contained 12.25% N. The nitration of  $\text{Ph}_2\text{NNO}$  proceeded differently. With 1 mol. of  $\text{HNO}_3$ , o- and p- $\text{O}_2\text{NC}_6\text{H}_4\text{N}(\text{NO})\text{Ph}$  were formed. The latter consisted of colorless, leafy crystals, m.  $132-3^\circ$ , which, when boiled with alc. containing  $\text{KOH}$ , yielded p- $\text{NO}_2\text{C}_6\text{H}_4\text{NHPh}$ , S-yellow, platy crystals, m.  $131-2^\circ$ . 2 mols. of  $\text{HNO}_3$  formed yellowish white crystals, m.  $156-9^\circ$  (decompn.) and consisted of cinnabar-red 2- $\text{NO}_2\text{C}_6\text{H}_4(4\text{-NO}_2\text{C}_6\text{H}_4)\text{NH}$  (c), m.  $219^\circ$ , and 2- $\text{NO}_2\text{C}_6\text{H}_4(4\text{-NO}_2\text{C}_6\text{H}_4)\text{NNO}$  (d) (the white portion), the latter colored dark orange by  $\text{H}_2\text{SO}_4$ . From the filtrate, by pptn. with  $\text{H}_2\text{O}$ , was obtained (b), m.  $213-4^\circ$ , which, in alc., gave a violet color in the presence of a trace of alkali. From the action of 6 mols.  $\text{HNO}_3$  on p- $\text{O}_2\text{NC}_6\text{H}_4\text{N}(\text{NO})\text{Ph}$  in glacial  $\text{AcOH}$  a solid m.  $155-9^\circ$  sepd. It was probably (p- $\text{NO}_2\text{C}_6\text{H}_4)_2\text{NNO}$ . This compd., boiled with xylene under a reflux, liberated brown fumes and a portion sol. in  $\text{CCl}_4$  was obtained which m.  $205-10^\circ$  and was probably (b). (a) was obtained by pptn. with  $\text{H}_2\text{O}$  from the original  $\text{AcOH}$  soln. Each of the 3 light yellow dinitrodiphenylnitrosamines prepd. by the authors loses  $\text{NO}_2$  when heated, a property of interest in connection with heat tests for nitrocellulose powders stabilized by addition of  $\text{Ph}_2\text{NH}$ . These expts. indicate that in the absence of  $\text{HNO}_3$  the  $\text{Ph}_2\text{NH}$  is first converted into its nitrate, the color changes ranging through yellow, green and black-brown to red as the concn. of  $\text{HNO}_3$  is increased. In only one case was there a trace of nitrosamines formed during these reactions. The chief products are the brown resinous substance (a), (b) and (c). When one equiv. of  $\text{HNO}_3$  is present  $\text{Ph}_2\text{NNO}$  is first formed, being converted then into p- $\text{O}_2\text{NC}_6\text{H}_4\text{N}(\text{NO})\text{Ph}$ . In the next stage the sparingly sol., yellowish white (d) seps. from the system. (a) is the final product. 2,4-Dinitro- and 2,4,6-trinitrodiphenylamine were not isolated. A dinitrodiphenylnitrosamine is the main product in every case where  $\text{HNO}_3$  is also present. Its formation indicates the completion of the stabilizing action of the  $\text{Ph}_2\text{NH}$ . It interferes with heat tests at  $110$  or  $135^\circ$  and possibly with the Abel test. Owing to the loss of  $\text{NO}_2$  from the nitrosamine group, this compd. may lower the degree of stability of the powder.

C. H. KIDWELL.

The constitution of acetic acid. J. C. THOMLINSON. *Chem. News* 118, 23-4 (1919).— $\text{AcOH}$  vapor at  $135^\circ$  has d. 3.01, at  $300^\circ$  2.08. At the lower temp. it is assumed that the vapor has the mol. formula



while at  $300^{\circ}$  the d. corresponds to the formula  $\text{MeCO}_2\text{H}$ . Additional evidence justifying the first formula is: the sp. heat of  $\text{AcOH}$  vapor taken as 0.4 would indicate an absorption per g. mol. of  $0.4 \times 165 \times 60 = 3960$  cal. through the range of temp. in which this change occurs, corroborating conclusions drawn for a C atom changing from a single to double linking (*Chem. News* Jan. 1906); possibility of stereo-isomerism which is shown by a divergence in b.-p. detns. and by slight differences in titrating with  $\text{NaOH}$  or  $\text{Ca(OH)}_2$ , since the normal Na salt is slightly alk. while the Ca salt is neutral;  $\text{AcOH}$  of max. d. is formed by a union of 67.7 parts of acid with 18 of  $\text{H}_2\text{O}$ , but with a hydrate,  $\text{C}_2\text{H}_4\text{O}_2 \cdot \text{H}_2\text{O}$ , the ratio would be 60:18. The possible persistence of the double

structure of  $\text{Ac}_2\text{O}$ ,  $\begin{array}{c} \text{Me}-\text{CO} \\ \diagdown \quad \diagup \\ \text{O} \\ \diagup \quad \diagdown \\ \text{Me}-\text{CO} \end{array}$ , in the mol. of  $\text{AcOH}$  may be due to the fact that its d.

is almost identical with the max. for  $\text{AcOH}$ .

C. H. KIDWELL.

**The manufacture of synthetic acetic acid and other organic chemicals in Canada.** ANON. *Can. Chem. J.* 3, 56-7(1919).—The Canadian Electro Products Co., Ltd., at Shawinigan Falls, Que., has erected 2 plants each having a capacity of approx. 700-800 gross tons glacial  $\text{AcOH}$  per month by the following process: 1. Conversion of  $\text{C}_2\text{H}_2$  to  $\text{MeCHO}$  in the presence of  $\text{H}_2\text{SO}_4$  and a Hg salt. 2. Conversion of the  $\text{MeCHO}$  to  $\text{AcOH}$  by oxidation in the presence of a catalyzer. 3. Catalytic decompn. of glacial  $\text{AcOH}$  into  $\text{Me}_2\text{CO}$ . Only pure products are used for each successive step, glacial  $\text{AcOH}$  of over 99% thus being obtained on the first run. This  $\text{AcOH}$  is free from  $\text{H}_2\text{SO}_4$ , tar, and resinous matter and is water-white, a great advantage in the manuf. of colors. It is possible that alc.,  $\text{Ac}_2\text{O}$ ,  $\text{C}_2\text{H}_2\text{Cl}_2$ ,  $\text{CCl}_3\text{CH(OH)}_2$ ,  $\text{CHCl}_3$ ,  $\text{C}_2\text{H}_2\text{Cl}_2$ ,  $\text{AcOEt}$ ,  $\text{HCHO}$ ,  $\text{CH}_2\text{ClCO}_2\text{H}$ , and  $(\text{C}_2\text{H}_4\text{O})_2$ , may be manufd. at the same plant. C. H. K.

**Intramolecular wandering of the phenyl group.** P. J. MONTAGNE. *Leyden. Chem. Weekblad* 15, 1195-204(1918); cf. *C. A.* 13, 730. JULIAN F. SMITH.

**The reduction products of hydroxymethylenecamphor.** I. H. RUPE, A. AKERMANN AND H. TAKAGI. *Basel. Helvetica Chim. Acta* 1, 452-72(1918).—The attempts of Kötzt and Schaeffer (*C. A.* 6, 2757; 8, 1094) to prep. keto alcs. by reducing hydroxymethylene compds. in presence of colloidal Pd or Pt yielded chiefly Me ketones. By using Ni as the catalyst, however, a smooth reduction to the keto alc. is possible. Ni pptd. on various carriers, as recommended by Kelber (*C. A.* 10, 897), gives unsatisfactory results. The best reductions are obtained with a catalyst made by pptg. Ni on finely powdered clay (made from porous plates). This powder, containing about 33% of Ni, can be kept for months in a sealed tube, in an atm. of  $\text{CO}_2$ , with very little deterioration. The hydrogenation of hydroxymethylene-camphor (A) is best carried out at slightly more than 1 atm. pressure. The substance is dissolved in 10 parts by wt. of  $\text{EtOH}$ , or in dil.  $\text{NaOH}$ . When  $\text{EtOH}$  is used, part of it is reduced to  $\text{MeCHO}$ . The velocity of reduction depends on the amt. of catalyst, being much greater if the ratio of catalyst to substance is 2:1 than if it is 1:1. As a rule the absorption of H ceases before the calcd. amt. is used, partly because some absorption occurs while replacing the  $\text{CO}_2$  in the reduction chamber with H, and partly because of the decompn. of  $\text{H}_2\text{O}$  by the Ni. Very little unchanged (A) is left. The absorption curve rises rapidly to the point of complete hydrogenation, where it suddenly becomes almost horizontal. Slight amts. of Cu, or larger amts. of  $\text{Fe}^{2+}$ , poison the catalyst, but  $\text{Fe}^{3+}$  does not. The yield of camphylcarbinol (B) varies from 80 to 95% of the theoretical, the remainder being chiefly methylenecamphor (C) and other low boiling substances. Purification is best effected by means of the  $\text{CaCl}_2$  compd., which is powdered and washed thoroughly with  $\text{PhH}$ , then decompd. with  $\text{H}_2\text{O}$ , yielding pure (C), b.  $138-41^{\circ}$ . The  $\text{HBr}$  ester (camphylbromomethane), m.  $65.5-66^{\circ}$ , is obtained with 96% yield by treating with 1.5 mols. of  $\text{PBr}_3$  at about  $0^{\circ}$ . When treated with moist  $\text{Ag}_2\text{O}$  it yields (B), but the

yield is low. The HCl ester, m.  $53-4^{\circ}$ ,  $b_{14}$   $125-7^{\circ}$ , is obtained, with 80% yield, by treatment with  $\text{SOCl}_2$ . When prepd. by passing dry HCl into liquid (B), the yield is only 55%. Oxidation of (B) with an excess of  $\text{CrO}_3$  gives up to 50% yields of camphorquinone, m.  $197^{\circ}$ , and a mobile oil,  $b_{10}$   $125-30^{\circ}$ , which is not an aldehyde. No (A) is formed. Though camphoraldehyde has not yet been prepd. by oxidation of (B), the suggestion is made that it is probably formed and immediately rearranges to (A), which is then oxidized to camphorquinone; or, less probably, it may be oxidized to the  $\text{CO}_2\text{H}$  acid and then to the quinone. Oxidation with  $\text{MnO}_2$  in  $\text{H}_2\text{SO}_4$  yields very small amts. of a compd., m.  $201^{\circ}$ , having 76.44% C and 8.78% H. No camphorquinone is formed. Comparison of the optical properties of (B) after purification by distn., by means of the  $\text{CaCl}_2$  compd., and by esterification with  $\text{BzCl}$  and sapon., gave evidence that only the last named method yields optically pure (B); the values of  $[\alpha]_D^{20}$  are consistently somewhat higher than for samples prepd. by the first 2 methods. All 3, however, give samples having the same sp. gr. ( $d_4^{20}$  1.0502) and b. p. ( $b_9$   $138-41^{\circ}$ ). The purification by means of the Bz ester is unexpectedly difficult. The ester can be obtained, with 98% yield, by esterification with  $\text{BzCl}$  in  $\text{C}_6\text{H}_6\text{N}$ ; but sapon. with alc. KOH yields only (C), owing to dehydration of (B) as fast as formed. Other alk. sapon. agents give the same results. Acids react very slowly, with partial dehydration of (B), and give very low yields. Phthalic anhydride does not esterify (B); the product of the reaction is (C). The formyl ester, however, can be obtained in quant. yield by esterifying with 86%  $\text{CH}_2\text{O}_2$ . From dil. EtOH it forms long, silky needles, m.  $74-5^{\circ}$ ,  $b_{11}$   $142-3^{\circ}$ . In view of the dehydrating power of  $\text{CH}_2\text{O}_2$ , this easy prepn. is unexpected; but (B) seems to be peculiarly susceptible to dehydration by alk. rather than acid agents. Similar success is possible with the Ac ester, which is a colorless, mobile liquid of pleasant odor,  $b_{10}$   $148.5-49^{\circ}$ . As by-products of the hydrogenation of (A), the following substances are formed: (I) (C),  $b_{10}$   $82-4^{\circ}$ , m. slowly about  $40^{\circ}$  (impure). The crude substance yields the pure hydrobromide, m.  $65-6^{\circ}$ , and dibromide, m.  $108-9^{\circ}$ . Pure (C) can be prepd. by treating the hydrobromide, or better still (B), with KOH in MeOH. The substance described by Minguin (*Compt. rend.* 136, 752(1903)) is repeatedly described in the literature as pure, but it was not. Pure (C), m.  $43.5-44^{\circ}$ , congeals when cooled to  $35-30^{\circ}$  to a white, waxy mass. Its odor is like that of camphor, but less pleasant. It is so sol. that no solvent has been found from which it can be recrystd. When distd. repeatedly *in vacuo*, it polymerizes slowly. (II) Methylcamphor, recovered from the filtrates after treating (C) with HBr, or prepd. by reduction of (C) (yield quant.). It is a camphor-like solid, m.  $37.5-8.5^{\circ}$ ,  $b_{10.5}$   $90-1^{\circ}$ ,  $b_{11}$   $88-9^{\circ}$ . (III) The Et ether of (B), and (IV) the Et ether of (A), formed by condensation with the EtOH used as solvent. No optical isomer of (B) has yet been isolated. JULIAN F. SMITH.

**Constitution of strychnine.** Preliminary note. L. REUTTER. Geneva. *Schweiz. Apoth.-Ztg.* 56, 650-1(1918).—Strychnine (100 g.) was dry-distd. with 1 kg. Zn dust under reduced pressure. The distillate was aq., then oily, recalling the odor of pyridine and conicine. The distn. residue was successively extd. with  $\text{Et}_2\text{O}$ , EtOH,  $\text{CHCl}_3$ . After distg. off the solvents, the united extn. residues were in part subjected to fractional distn., yielding apparently indole, pyridine, conicine and quinoline. In another part a mixt. of bases was isolated by means of dil. HCl, NaOH and  $\text{Et}_2\text{O}$ ; these bases were fractionated. In the fraction  $110-30^{\circ}$ ,  $\text{C}_8\text{H}_9\text{N}$  was identified by its b. p. and the m. p. of the picrate and chloroplatinate. Between  $130$  and  $150^{\circ}$ , picoline and lutidine were probably present; between  $150$  and  $190^{\circ}$  conicine was identified (C and H detns. and b. p.; m. p. of the HCl salt and aurate). The fraction  $200-250^{\circ}$  contained quinoline. S. WALDBORT.

**Thienylquinolinecarboxylic acid.** MAX HARTMANN AND ERNST WYBERT. Soc. Chem. Ind., Basel. *Helvetica Chimica Acta* 2, 60-3(1919).—The purpose of the

investigation was to det. the influence of a substitution of the thiophene group for the Ph group in the cinchoninic acid mol. H. and W. find that this substitution increases the antiphlogistic and analgesic properties and that a peculiar side effect is produced when the new S compound as an acid or an ester is administered to animals by feeding the acid or by injection of a sol. salt into the blood. The animal shortly assumes a violet color and the urine is colored a deep permanganate which persists for a very long time; the color spreads to nearly all internal organs. This coloring matter was isolated from the urine in good yields but its constitution remains unknown. H. and W. believe this coloring matter to be produced within the animal through oxidation and subsequent condensation with unknown substances of animal origin. The production of the same coloring matter from the S compd. *in vitro* was not accomplished even when treated with enzymes or sections from various organs. *2-Thiënnylquinoline-4-carboxylic acid* is prepd. by heating on a water bath with stirring for three hrs. a mixt. of 80 g. acetothienone, 88 g. isatin, 470 cc. 28% KOH and 70 cc. alc.; on cooling the acid is pptd. with AcOH and recrystd. from alc.; yellow crystals, m. 211°; slightly sol. in H<sub>2</sub>O; fairly sol. in hot alc.; sol. in alkalis with pptn. by dil. acids; sol. in excess of concd. acids. Variation in crystn. gives either colorless or yellow crystals of the same m. p. An ester, m. 83° is prepd. from EtOH and HCl; the salts are very sol. in H<sub>2</sub>O with neutral reaction. The violet coloring matter in the urine was obtained by adding a large vol. of slightly acidified alc., filtering and evapg. to dryness and recrystg. from alc.; it is sol. in alkalis, forming brown salts.

N. A. LANGE.

**Hydroxycarbonyl compounds. I. A new synthesis of hydroxyaldehydes.** P. KARRER. Univ. Zurich. *Helvetica Chimica Acta* 2, 89-94(1919).—The interaction of CNBr and polyhydric phenols in the presence of HCl produces aldehydes in good yields but does not produce carboxylic acids nor ketones, as might be expected from the similarity of this reaction to the Gattermann aldehyde synthesis. K.'s method is better than G.'s because CNBr can be employed in place of the dangerous dry HCN and since the yields are good K. believes it will replace the older method for the prepn. of this class of compds. *2,4-Dihydroxybenzaldehyde*. (A) A rapid stream of dry HCl was passed for several hrs. into a soln. of 10 g. resorcinol (B), 150 cc. abs. Et<sub>2</sub>O, 3 g. anhydrous ZnCl<sub>2</sub>, 5 g. CNBr. Crystals appear after several hrs. and the reaction mixt. is allowed to stand overnight; these crystals are an intermediate compound (C) of the probable constitution  $\text{C}(\text{OH})\text{:C}(\text{OH})\text{:CH.CH:NCl}$ . After decanting

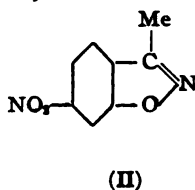
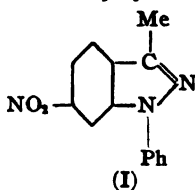
the Et<sub>2</sub>O, the crystals (C) are washed with abs. Et<sub>2</sub>O, dissolved in H<sub>2</sub>O and the aq. soln. is extd. with Et<sub>2</sub>O to remove (B). The aq. soln. is boiled 20 min. and then extd. with Et<sub>2</sub>O; the dried Et<sub>2</sub>O ext. is evapd.; the residue is recrystd. from Et<sub>2</sub>O by addition of ligroin when (A) is obtained. Phloroglucinaldehyde was obtained in a similar manner when phloroglucinol.

N. A. LANGE.

**Ring formation with the loss of a nitro group.** S. REICH AND MILE. V. NICOLAEVA. Org. Chem. Lab., Geneva. *Helvetica Chimica Acta* 2, 84-8(1919).—*2,4-Dinitroacetophenone oxime* (A). A soln. of equimol. proportions of dinitroethylbenzene and Am nitrate in abs. alc. is cooled to 0° and Na alcoholate is gradually added. The soln. turns brown and a brown ppt. forms. After several hrs. it is treated with H<sub>2</sub>O, filtered, and the oxide is pptd. by acidifying the filtrate. After repeated crystns. from alc. (A) is obtained in yellow prisms, m. 124°. (A) is heated for 1/4 hr. with 15% HCl; H<sub>2</sub>O is added, and the soln. extd. with Et<sub>2</sub>O. The Et<sub>2</sub>O is dried with CaCl<sub>2</sub> and distd., the ketone *2,4-dinitroacetophenone* (B) forming an oily yellow liquid which does not solidify after 3 months. (B) forms a *phenylhydrazane*, red-brown clusters from alc., m. 165-6°. When (B) in alc. is treated with cold. aq. KOH, the original red soln. changes to blue,



then green and finally yellow; upon addition of  $\text{H}_2\text{O}$  methylphenylnitroisindazole (I) is pptd.; recrystd. from dil. alc. it is obtained in yellow crystals, m.  $139-40^\circ$ . Among the 3 by-products in the prepn. of (A) is a methylnitroindoxazine (II). This is sepd



from the other two by fractional crystn. from alc.; it is obtained in largest quantity and m.  $114^\circ$ . The other two components m.  $200^\circ$  and  $63^\circ$ ; they were not further investigated. N. A. LANGE.

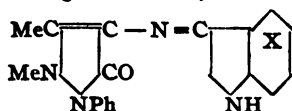
**Action of magnesium and zinc on dichloromethylarsine.** ENRIQUE V. ZAPPI. Chem. Inst., Buenos Aires. *Bull. soc. chim.* 23, 322-4 (1918).—1 mol.  $\text{MeAsCl}_2$  and 2 mols. Mg were boiled 3 hrs. in 25 cc. anhydrous  $\text{Et}_2\text{O}$  under a cold reflux. 1 part of the  $\text{Et}_2\text{O}$ , upon evapn., left a residue of  $\text{MeAsCl}_2$  which was not decompd. by addition of 1 part  $\text{H}_2\text{O}$ . But the part remaining in the flask with the Mg was decompd. rapidly by  $\text{H}_2\text{O}$  with the production of an As-contg. gas. To 1 mol. granular Mg and 1 mol.  $\text{MeAsCl}_2$ , contained in a flask fitted with a Br tube and a tube to collect the gas,  $\text{H}_2\text{O}$  was added through the Br tube. A violent reaction occurred yielding a gas (A), a red substance (B) and an aq. residue (C). (A) was a colorless gas, insol. in  $\text{H}_2\text{O}$ , which burned with production of  $\text{CO}_2$ , oxidized in air producing white fumes, reduced  $\text{NH}_3$ - $\text{AgNO}_3$  and HI; it was absorbed by  $\text{HNO}_3$ , the soln. giving the reactions of  $\text{H}_2\text{AsO}_4$ , although the residue from the evapn. of the  $\text{HNO}_3$  soln. gave the reactions of  $\text{MeH}_2\text{AsO}_4$ . The per cent. compn. of the mixed gas was:  $\text{MeAsH}_2$ , 33;  $\text{H}_2$ , 60;  $\text{CH}_4$ , 2.6;  $\text{N}_2$ , 4. The presence of the last 3 gases is due to the action of small amts. of  $\text{O}_2$  getting into the flask. (B), filtered from (C) and boiled with  $\text{H}_2\text{O}$  acidified with  $\text{H}_2\text{SO}_4$  to remove excess Mg, washed with  $\text{H}_2\text{O}$  and dried over  $\text{H}_2\text{SO}_4$ , changed slowly from red to violet in color. It had a nauseating odor, melted and volatilized, giving  $\text{As}_2\text{O}_3$  fumes without leaving a residue; it was ignited when dropped into boiling  $\text{HNO}_3$  and the soln., evapd., left a residue possessing the reactions of an acid of  $\text{MeH}_2\text{AsO}_4$ , and not those of  $\text{H}_2\text{AsO}_4$ . Analysis showed it to be MeAs. (C) contained  $\text{MgCl}_2$  and did not give the reactions of  $\text{H}_2\text{AsO}_4$ . These results show that Mg does not act directly on  $\text{MeAsCl}_2$  in the presence of anhydrous  $\text{Et}_2\text{O}$  and is not capable of forming a Mg deriv. In the presence of  $\text{H}_2\text{O}$  there is a violent reaction with the formation of  $\text{MeAsH}_2$ ,  $\text{H}_2$ ,  $\text{CH}_4$  and pptn. of  $(\text{CH}_3\text{As})_x$ . Zn is capable of producing the same reactions. C. H. KIDWELL.

**Synthesis of alcohols in the thiophene series.** V. THOMAS AND V. COUDERC. Clermont-Ferrand. *Bull. soc. chim.* 23, 326-8 (1918).—T. has shown that  $\text{C}_4\text{H}_5\text{SI}$  reacts with Mg, forming organo-Mg compds. possessing the general properties of those of the  $\text{C}_4\text{H}_5$  series (*Bull. soc. chim.* 5, 730). The  $\text{C}_4\text{H}_5\text{SMgI}$  is employed here to react with ketones in the prepn. of alcs. of the  $\text{C}_4\text{H}_5\text{S}$  series. It reacts with  $\text{Ph}_3\text{CO}$ , forming diphenylthienylcarbinol,  $\text{Ph}_2\text{C}(\text{OH})\text{C}_4\text{H}_5\text{S}$ , which is also obtained by condensation of  $\text{PhMgI}$  with  $\text{PhCOC}_4\text{H}_5\text{S}$  (72% yield).  $\text{C}_4\text{H}_5\text{SMgI}$  appears to condense with the  $\text{PhNH}_2\cdot\text{HCl}$  in  $\text{AcOH}$  to form colorless leaflets which are being studied.  $(\text{C}_4\text{H}_5\text{S})_2\text{C}(\text{OH})\text{Ph}$  results by condensing  $\text{C}_4\text{H}_5\text{SCOPh}$  with  $\text{C}_4\text{H}_5\text{SMgI}$ . A compd. m.  $90^\circ$  can also be isolated, hexagonal lamellae or large, prismatic needles; alters in air and light more easily than the  $(\text{C}_4\text{H}_5\text{S})_2\text{C}(\text{OH})\text{Ph}$  but both compds. dissolve in  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$  and  $\text{HCl}$  to a brown soln. not produced by  $\text{AcOH}$  and  $\text{Me}(\text{CH}_2)_3\text{CO}_2\text{H}$ .  $(\text{C}_4\text{H}_5\text{S})_2\text{C}(\text{OH})\text{Ph}$  is sol. in alc.,  $\text{Et}_2\text{O}$  and benzene; insol. in  $\text{H}_2\text{O}$ ; 50% yield.  $\text{C}_4\text{H}_5\text{SMgI}$ , prepd. with  $1/8$  mol.  $\text{C}_4\text{H}_5\text{SI}$  and  $7/8$  mol. Mg, was condensed with  $1/8$  mol.  $(\text{PhCO})_2$ . Upon evapn.

a brown, resinous material appeared which yielded by steam distn. colorless needles m.  $56^{\circ}$ . By the same method, the wash  $H_2O$  yielded the same product; long, colorless needles, m.  $56^{\circ}$ , were obtained by soln. in alc. and purification with animal charcoal. Although its constitution has not been detd., the compd. is probably thienylphenylbenzoin,  $Ph(C_6H_5S)C(OH)COPh$ ; calcd. mol. wt. 294; found, 285.

C. H. KIDWELL.

Some derivatives of isatin. ANDRÉ MEYER. *Compt. rend.* 167, 1070-3(1918).—Knorr (*Ann.* 238, 192) obtained, by oxidation of aminophenylmethylpyrazolone, a dark red compd., rubazonic acid. M. has investigated a series of rubazonic acids derived from phenylisoxazolone (*C. A.* 5, 3224). Baeyer and Knop (*Ann.* 140, 37) observed a fuchsin-red color, reflecting green, as an intermediate step during the synthesis of isatin by reduction of isonitroso-oxindol and further oxidation of amino-oxindol. On oxidation with air of the product of the reduction of nitroso- $\gamma$ -hydroxycarboxystyryl, Baeyer and Homolka (*Ber.* 16, 2219) noted a dark blue indigo ppt. The purpose of this investigation is to study the nature of such products. Isatoxime, reduced by Sn and concd. HCl until the soln. was decolorized, the soln. then being filtered and evapd. at a low temp. to drive off excess HCl, yielded the amino-oxindol chlorostannate, colorless leaf-like crystals, after crystn. from dil. HCl. The chlorostannate, decompd. by  $H_2S$ , furnished a soln. of the hydrochloride which turned red in the air and from which the salt was isolated by concn. *in vacuo*. The acidity of the soln. was detd. by titration and sufficient alkali was added to liberate the amine. When oxidation was carried out by a calcd. amt. of  $K_2Fe(CN)_6$ , only a small yield of red ppt. was obtained, a large amt. of the amino-oxindol being converted into isatin. Reduction of the red compd. by  $Na_2S_2O_4$  in a strong alk. medium, and warming, gave a yellow soln.  $H_2SO_4$  dissolved the compd.; the red soln. decomposed on diln. with the formation of a yellow color. Concd. alkali produced a violet color. Isatoxime, reduced with AcOH and Zn, yielded a dark red color, reflecting green, from which dark red crystals pptd. This compd., washed with dil. AcOH and  $H_2O$  and recrystd. from alc. and AcOH, was  $C_{16}H_{10}O_2N_2Zn$ , the salt of an isomer of indigo,  $C_{16}H_{10}O_2N_2$ . It gave a violet color with concd.  $H_2SO_4$ , dissolving to orange-red; on diln. and warming it was hydrolyzed to produce a brown soln.  $Na_2S_2O_4$  in an alk. medium dissolved it, forming a brown soln. These characteristics indicate that the compd. acts here as the indine of Laurent (*Ann. chim. phys.* [3] 3, 471), which is probably identical with the iso-indigotin of Wahl and Bagard (*Bull. soc. chim.* 5, 1039). Some mixed rubazonic acids of the isatin series were prepd. by condensing, in alc., aminoantipyrine with isatin, 5-bromisatin, 5,7-dibromisatin and naphthisatin. These red compds., sol. in  $H_2SO_4$  with dark violet color, hydrolyzable in dil. acids, insol. in  $H_2O$  and slightly sol. in organic solvents, are of the general type:



X representing the substituted  $C_6H_5$  or  $C_{10}H_7$  nucleus.  $C_6H_4.CH.NH_2.CO.NH$  cannot

be diazotized, thus behaving as a substituted benzylamine, not as a heterocyclic amine. It condenses with aromatic aldehydes.

C. H. KIDWELL.

New salts of *As-dimethylarsepedine*. ENRIQUE V. ZAPPI AND JUAN L. LANDABURU. *Chem. Inst., Buenos Aires. Bull. soc. chim.* 23, 324-6(1918).—The prepn. of these salts was accomplished by the satn. of a soln. of the hydrate of *As-dimethylarsepedine* (*C. A.* 10, 2874) with the acid of which a salt was desired. The resulting soln. was evapd. over  $H_2SO_4$ , then solid NaOH and finally over  $P_2O_5$ . Vacuum was not used since it partially decomp. the salts. *As-Methylarsepedine methochlo-*

ride,  $\text{CH}_3 \begin{array}{c} \text{CH}_3-\text{CH}_2 \\ \text{CH}_2-\text{CH}_3 \end{array} \text{As} \begin{array}{c} \text{CH}_3 \\ \text{CH}_3 \\ \text{Cl} \end{array}$ , is a white, odorless cryst. solid, m.  $237^\circ$  (decompn.),

very hygroscopic, forms a neutral soln. in  $\text{H}_2\text{O}$  possessing characteristic Cl reactions. The corresponding *bromine compound*,  $\text{C}_7\text{H}_{13}\text{AsBr}$ , is a white solid, somewhat hygroscopic, m.  $277-80^\circ$  (decompn.), giving a neutral soln. possessing the reactions of Br. The *sulfate*,  $(\text{C}_6\text{H}_{13}\text{AsMe}_2)_2\text{SO}_4$ , is an odorless, slightly hygroscopic white solid, m.  $232^\circ$  (decompn.), whose  $\text{H}_2\text{O}$  soln. is neutral to litmus and ppts. with Ba salts. The *nitrate*,  $\text{C}_7\text{H}_{13}\text{NO}_2\text{As}$ , is a hygroscopic light brown solid, m.  $260^\circ$  (not sharp); its soln., reduced by  $\text{H}_2\text{SO}_4$  and Zn, liberates the N as  $\text{NH}_3$ . By passing  $\text{CO}_2$  into a soln. of arsenic dimethylarsenedine, the alkalinity of the hydrate is lost to phenolphthalein but not to litmus. When this soln., which contains the carbonate,  $\text{C}_6\text{H}_{13}\text{AsMe}_2\text{CO}_2\text{H}$ , was evapd. over  $\text{P}_2\text{O}_5$  it left a dirty white residue with the disagreeable odor of methylarsenedine. The carbonate, m.  $156-7^\circ$  (decompn.), is very hygroscopic; its soln. is decompd. by acids with evolution of  $\text{CO}_2$  and ppts. Ag and Fe salts. C. H. KIDWELL.

**Synthetic camphor.** ANDRÉ DUBOSC. *Rev. prod. chim.* 21, 369-72 (1918).—A general review of the various methods available for the prepn. of synthetic camphor. No new facts are presented. M. P.

Silver-asbestos, lead chromate-asbestos and lead peroxide-asbestos for use in combustions (BINDER) 7. Acetone (BASSETT) 22. Determination of halogens in organic compounds (BUSCH) 7. Sapidity and stereoisomerism (BARRAL, RANC) 11H.

BAUER, RUDOLF AND WIELAND, H.: *Reduktion und Hydrierung organischer Verbindungen*. Leipzig: Otto Spamer. 324 pp. M. 20. For review see *Chem. Weekblad* 16, 185 (1919).

**Toluenesulfonic acids.** J. A. AMBLER and H. D. GIBBS. U. S. 1,292,950, Jan. 28. Toluenesulfonic acids are made continuously by passing vapors of toluene into contact with a descending current of  $\text{H}_2\text{SO}_4$  in a reaction tower. The pat. is "dedicated to the public" for free use without payment of royalty.

**Rectifying alcohol.** E. A. BARRET. U. S. 1,292,676, Jan. 28. Concd. alc. is obtained from fermented alc. liquid by heating the liquid sufficiently to drive off first runnings as vapors, and rectifying these first runnings by fractional condensation, heating the liquid from which the first runnings have been removed sufficiently to vaporize all the alc. which it contains, rectifying the alc. vapors thus produced together with the alc. condensate from the rectification of the vaporized first runnings, and withdrawing separately the alc. condensate from the rectification of the combined alc. vapors.

**Trinitrophenol and trinitrocresol.** RASIK LAL DATTA and PHULDEO SAHAY VARMA. U. S. 1,292,266, Jan. 21. Trinitro derivs. of phenol or cresol are produced by reacting upon phenol- or cresolsulfonic acid with nitrous gases such as the mixt. of  $\text{N}_2\text{O}_4$  and  $\text{N}_2\text{O}$  produced by the oxidation of N in an elec. arc furnace. A soln. of the pure trinitro compd. is obtained, except for the presence of a small amt. of  $\text{H}_2\text{SO}_4$  produced in the reaction. No charring or blackening of the product takes place.

**Urea.** K. NIKRISHNEM, C. BOSCH and A. MITTASCH. U. S. 1,292,019, Jan. 21.  $\text{NH}_4$  carbamate, mixed with 5% of  $\text{K}_2\text{CO}_3$  or 3% of  $(\text{NH}_4)_2\text{SO}_4$ , is heated under pressure to  $135-40^\circ$ . Formation of urea takes place more quickly than with  $\text{NH}_4$  carbamate alone. Other  $\text{NH}_4$  salts may be used, e. g., selenite, chloride, acetate, oxalate or citrate, and other salts also (e. g.,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{S}$ , Na formate or

$\text{CaCl}_2$ ), may serve as catalysts. After the reaction, the urea may be freed from the catalytic salts by dissolving it in alc. A small quantity of  $\text{H}_2\text{O}$  or of  $(\text{NH}_4)_2\text{CO}_3$  may be added, as promoters of the reaction.

## II. BIOLOGICAL CHEMISTRY.

HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

**Value of modern chemistry.** JOHN G. WURTZ. *Hahnemannian Monthly* 53, 740-7(1918).—A summary of recent researches on the chemistry of the blood and urine, and their clinical application. JOSEPH S. HEPBURN.

**Technic for following the progress of proteolysis in a "gelatin-trypsin" medium.** L. LAUNOY. *Compt. rend. soc. biol.* 81, 742-4(1918).—The action of trypsin on a litmus-gelatin medium neutral to litmus results in an acid reaction within 1 hr. at  $41^\circ$ . The acidity increases rapidly until the 4th hr. of digestion, when it attains a concn. capable of retarding enzymic action; the acidity then increases slowly. The acidity is a good index of the rate of tryptic action. Production of acidity is at first more rapid in gelatin neutral to phenolphthalein than in gelatin neutral to litmus; the final result is the same in both cases. The action of trypsin results in the formation of certain acid substances (the identity of which is unknown) which may be titrated directly with NaOH; in addition, amino acids are produced, the acidity of the latter being titratable after action of formol (Sørensen method). In a "gelatin-trypsin" medium neutral to litmus the acidity liberated by formol is, during the first few hrs. of digestion, distinctly less than that of the acid substances above mentioned; the respective curves first diverge, then become parallel, approach each other, and finally cross at approx. the 30th hr. of digestion. Practically identical results were obtained with gelatin dialyzed 7 days as with undialyzed gelatin; the acidity produced during digestion cannot, therefore, be due to pre-existent compds. such as acids and acid salts which escaped neutralization and were then liberated by tryptic action. It is possible that these acid substances may be of the nature of the acid peptones studied by Siegfried and Krüger. This method of following the course of tryptic action by titration of the acidity produced may be applied to detn. of the antitryptic power of blood serum; in this case the serum and trypsin are added to gelatin which is neutral to litmus.

H. S. PAINE.

**Catalytic action of serpents' venom upon nucleic acids.** C. DELEZENNE AND H. MOREL. *Compt. rend.* 168, 244-6(1919); cf. *C. A.* 5, 1943, 3093; 7, 1752; 8, 3591.—Nucleic acids from beer yeast and from animal thymus were prepd. in as pure form as possible and made into the Na salts. These were dissolved in a concn. of 1 to 2% in a 9% soln. of salt water and the solns. made strictly neutral to phenolphthalein. To these were added variable amts. of venom from serpents of the families Colubridae and Viperidae made into 1% strength in physiol. saline. All manipulations were made in a manner to favor sterility of the mixts., and the latter were placed in a thermostat at  $50^\circ$  for varying lengths of time. The results showed that the nucleic acids were hydrolyzed by the venom. The cobra venom, which was most active, caused the nucleate rapidly to lose the property of being pptd. by HCl. Thymonucleate, which gelatinizes readily, remains liquid or gelatinizes slowly after being acted upon by the venom. The liquid medium becomes acid to both phenolphthalein and tournesol due to the liberation of  $\text{H}_2\text{PO}_4$ , the progress of the reaction being detd. by titration with NaOH. Acidity which at first increases rapidly with the time later augments more

slowly, the reaction being of a diastatic type. On the other hand small amts. of venom develop the same acidity with the time as large amts., there being no relation between amts. of material transformed and the quantity of venom utilized. There is no action at 0°; it is slow at ordinary temps.; the optimum temp. is 50 to 52°. The venom loses its hydrolyzing properties by being heated a few min. at 100°. The activity of the venom is totally destroyed by the addition to the medium of a specific antivenomous serum. The more toxic the venom the greater is its hydrolyzing power.

L. W. RIGGS.

**Biological reactions of the species and parasitic specificity.** J. DUFRÉNOY. *Rev. gén. sci.* 30, 44-7(1919).—Parasitic specificity and the resistance of the hosts are characters which, although relative, are rather stable, permanent, hereditary and depend immediately upon no one ecologic factor. It is important to exterminate the receptive hosts which perpetuate the parasite, resulting in massive infections. The parasites which form with their hosts a durable syntrophic association, appear with a specific exigence such that they separate into physiologically racial groups, the more pronounced into morphologic groups. Accordingly these parasites show the best reactions for the purpose of defining their specific groupings and the phyletic relations of the different species. The work of Stakman (Univ. Minnesota) is freely quoted. L. W. RIGGS.

ASHER, PHILIP: *Chemistry and Toxicology for Nurses*. Philadelphia: W. B. Saunders Co. 195 pp. \$1.50.

MILLISH, MRS. M. H.: *Collected Papers of the Mayo Clinic, Rochester, Minn.* Vol. IX, 1917. Philadelphia and London: W. B. Saunders Co. 866 pp. inclusive of index. For review see *Philippine J. Sci.* 13B, 333.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

A method for the determination of fat in dried feces and its distribution as soap, free fatty acids and neutral fat. An application to feces of the Roesse-Gottlieb method for determining fat in dried and condensed milks. L. E. HOLT, A. M. COURTNEY AND H. L. FALES. *Am. J. Dis. Children* 17, 38-42(1919).—A sample of thoroughly dried and powdered feces is treated with dil. HCl on the water bath until well heated and disintegrated. The mixt. is transferred to a Roehrig tube and extd. with Et<sub>2</sub>O and petrol. ether. The residue from these exts. gives the total fat. Another sample is disintegrated with water before extg., giving neutral fat and free fatty acids. The difference between these detns. gives the soaps. The ext. from the non-acidified sample is dissolved in benzene and titrated while very hot with alc. NaOH, using phenolphthalein as indicator. The NaOH soln. is standardized with stearic acid. This gives the free fatty acids.

S. AMBERG.

Sudan III and the detection of fat. V. H. MORTRAM. *Proc. Physiol. Soc., J. Physiol.* 52, xviii(1918).—It is proposed to use Sudan III as a qual. test for fats as follows: 1 g. powdered solid is shaken with 10 cc. satd. soln. of Sudan III in 70% alc. for 1 min. The fluid is filtered off through a small fat-free paper and the color of the resultant soln. compared with that of a control. The control is prepd. by shaking 1 g. of a fat-free powder (*e. g.*, starch or casein) with Sudan III soln. and treating as above. When the tested-solid contains more than 0.04 g. of fat the Sudan III filtrate is markedly lighter in color than the control. It is thought that in some cases the test might be quant.

J. F. LYMAN.

A promising chemical photometer for plant physiological research. CHARLES S. RIDGWAY. *Mo. Weather Rev.* 46, 117-9(1918).—The method proposed by Bacon (*C. A.* 5, 1360) was used. The oxalic acid decompd. by light in the presence of U salts was detd. by titrating the undecompd. acid with 2 N KMnO<sub>4</sub>. It was found un-

necessary to ppt. the U before titration. A mixt. of 5 cc. of 1% U acetate and 20 cc. of 5% oxalic acid in a 100 cc. Florence flask was placed so that only its surface was exposed to light. Comparisons were made with the Callender recording pyrheliometer. The mean ratio, cal. recorded by the pyrheliometer to g. oxalic acid decomposed, was 978. In 9 cases the deviation from the mean ranged between 0.2% and 3% on either side. Greater variations in 4 cases were thought to be due to the occurrence of clouds or haze which affected the intensity of the rays at one end of the spectrum to a greater extent than those at the other end, or to intermittent cloudiness which made it impossible to evaluate the pyrheliometer record accurately. The chem. photometer probably shows the effect of light belonging chiefly to the violet end of the spectrum. No decompn. of the oxalic acid occurs in the dark in 3 days. In the diffuse light of the lab. several hrs. exposure are necessary before measurable decompn. results. The temp. coeff. over a wide range is negligible. R. considers that the simplicity and accuracy of the method should make it useful for plant physiological work. J. G. PHILLIPS.

**Detection of quinine in urine.** MEYER. *Pharm. Ztg.* 1918, 49; *Schweiz. Apoth. Ztg.* 56, 609(1918).—Add to urine  $(\text{NH}_4)_2\text{CO}_3$  in excess and  $\text{MgSO}_4$  ppt. with tannic acid, filter, set free quinine by  $\text{Ca}(\text{OH})_2$  on the water bath. Filter, dissolve all the quinine by washing with hot  $\text{H}_2\text{O} + \text{NH}_4\text{OH}$ , ext. the quinine in the filtrate by shaking with  $\text{Et}_2\text{O}$ . Evap. and weigh. S. WALDBOTT.

**Determination of fructose in presence of aldoses (HERZFELD, LENART) 7.**

MCJUNKIN, F. A.: **Clinical Microscopy and Chemistry.** Philadelphia: W. B. Saunders Co. 470 pp. \$3.50. For review see *J. Am. Med. Assoc.* 72, 819(1919).

### C. BACTERIOLOGY.

**A biochemical study of the plankton of Lake Mendota.** H. A. SCHUETTE. *Trans. Wis. Acad. Sci., Arts, and Letters* 19, 594-613(1918).—This is the first record, the author says, of a chem. examn. of composite catches of fresh-water plankton. The nature of the catch depends largely upon meteorological conditions, and the chem. compn. varies with the proportions of plant and animal forms. Data are given for ash,  $\text{SiO}_2$ ,  $(\text{CH}_3)_2\text{O}$  ext., physical and chem. constns. of oils, crude fiber, N in crude fiber, total S, total P, total N, protein N, non-protein N, N as  $\text{NH}_3$ , diamino N, monoamino N and "humic" N. Qual. tests showed small amts. of reducing sugars. All samples gave measurable amts. of furfural, but the amts. do not vary enough with vegetable and animal forms to apply detn. of pentosans as a means of estg. proportions of vegetable matter in mixts.

A. L. BARKER.

**Action of ozone on artificial culture media and on various bacteria, yeasts, and molds.** R. HEISE. *Arb. kais. Gesundh.-Amt.* 50, 418(1917); *Chem. Ztg.* 42, 137(1918); *J. Soc. Chem. Ind.* 37, 634A.—An  $\text{O}_3$  concn. of 3 mg. per cu. m. of air was sufficient to kill in 3-4 hrs. more than 95% of the bacteria present as individuals on the surface of a culture medium. The  $\text{O}_3$  penetrates with difficulty into the medium and into masses of bacteria; consequently colonies were hardly affected. Low temp. favored the action of the  $\text{O}_3$ . Similar results were obtained with yeasts, which proved to be slightly more sensitive. Both the spores and the mycelia of molds growing on the surface of a medium were killed, but any mycelium below the surface was not killed. It is concluded that only a partial destruction of organisms present on the flesh of animals preserved in cold storage can be expected by the use of ozonized air, but sufficient to improve the keeping qualities of the meat. E. J. C.

**Observations on the rate of growth of *Bacillus coli*.** RAYMOND C. SALTER. Iowa State College, Ames, Ia. *J. Infect. Dis.* 24, 260-84(1919).—A study of the rate of growth of *B. coli* under various conditions led to the following conclusions: After a period of lag, the rate of growth at 37° in 1/4% Difco peptone is const. and at a max.

from 6 to 8 hrs. Subcultures, during a period of const. rate of growth, as previously shown by Barber and others, do not show lag. Crystal violet decreases the rate of growth of *B. communis* in dilns. as great as 1:1000000. The effect of the dye is greatest during the lag period. *B. communis* will not grow in  $\frac{1}{2}\%$  Difco peptone H<sub>2</sub>O containing a concn. of crystal violet greater than 1:200000. A slight inhibition of growth is caused by a diln. of 1:1000000. Brilliant green in dilns. of 1:600,000 and 1:10,000,000. inhibits the growth of *B. coli* in  $\frac{1}{2}\%$  Difco peptone. Inhibition disappears between dilns. of 1:6,000,000 and 1:10,000,000. A slight stimulation is noted at 1:10,000,000. Crystal violet and brilliant green have a greater inhibitive effect on rapidly growing cultures than on old cultures. The action of dyes varies in different ways. Bile salts stimulate the growth of *B. communis* when added to  $\frac{1}{2}\%$  peptone in dilns. as high as 0.3-0.5%. Higher concns. of bile salts inhibit growth; 1% shows marked inhibition. Increasing the concn. of peptone up to 5% stimulates the rate of growth. The lag period is shortened in the greater concns. of peptone. Addition of K<sub>2</sub>HPO<sub>4</sub> to peptone in amts. up to 1% accelerates the rate of growth. Addition of beef ext. to peptone increases the rate of growth of *B. communis*, 0.5% giving slightly more rapid growth than 0.3%. The age of the culture greatly influences the rate of growth of *B. communis* during the lag period. Both the generation times and the duration of the lag are greater in old cultures. A marked increase in lag appears after 3 days.

JULIAN H. LEWIS.

**Sterilizing measured amounts of water in the autoclave.** H. A. NOYES. Purdue Univ. Agri. Exp. Station. *J. Bact.* 3, 537-40(1918).

JOHN T. MYERS.

**Note on the nature of the reaction of *B. coli* on Endo medium.** REUBEN L. KAHN. U. S. Army. *J. Bact.* 3, 547-54(1918).—Both chem. and physical factors enter into the formation of typically metallic colonies of *B. coli* on Endo agar. During the growth of these organisms on Endo medium, they adsorb the various sol. substances contained in the medium and proceed to break down the lactose first. After ten to fifteen hrs. incubation the trace of lactose adsorbed is probably transformed into lactic and other org. acids, and the colony is colored red. On further incubation, the org. acids are probably reduced by the bacteria to aldehyde and alc., which volatilize from the surface, leaving the non-volatile fuchsin behind, thus producing a metallic sheen. The carbohydrate being disposed of, the organisms proceed to attack the nitrogenous materials. NH<sub>3</sub> and other substances are produced in which fuchsin goes back into soln., and ultimate decolorization takes place. Several references are given.

JOHN T. MYERS.

**Bacteriological notes.** I. Gas production by *Bact. pullorum*. II. *Bact. pullorum* infections in adult birds. III. Relation between sucrose fermentation and immunizing power by *B. avisepticus*. PHILIP HADLEY, DOROTHY W. CALDWELL AND BERTHA M. HEATH. R. I. State College. *J. Bact.* 4, 65-9(1919).—Gas production by *B. pullorum* may depend upon whether the cultures are grown in glucose ext. or in glucose infusion broth. *B. avisepticus* typically produces an acid fermentation in sucrose. Among several strains examd., however, one was negative for this sugar. In this instance the absence of sucrose fermentation was correlated with the ability to produce, in rabbits, resistance against powerful infections with virulent cultures, an ability possessed by no other strain. Whether this relation of biochem. features is coincidental or whether it is of some definite significance in immunity production remains a question.

JOHN T. MYERS.

**Studies in forage poisoning.** The relation of *Bacillus botulinus* to forage poisoning or cerebral spinal meningitis in horses. ROBERT GRAHAM AND A. L. BRUECKNER. *J. Bact.* 4, 1-21(1919).—An anaerobic, spore-bearing bacillus isolated from a corn silage, proved to be responsible for an outbreak of forage poisoning. It engendered

forage poisoning in a mule following the ingestion of 2 cc. of the sterile filtrate broth culture. 0.02 and 0.03 cc. broth culture *per os* generally proved fatal in guinea pigs in 22 to 84 hrs. A goat serum was produced which protected guinea pigs, mules and horses from lethal doses of the isolated organism. This antitoxin was also protective against *B. botulinus* toxin. Serum immune to *B. botulinus* contained agglutinins against the organism isolated from forage.

JOHN T. MYERS.

**Studies on the proteolytic enzymes of soil fungi and Actinomycetes.** SELMAN A. WAKSMAN. *J. Bact.* 3, 309-30(1918).—The proteolytic enzymes contained in the fungi studied appear to differ from known proteolytic enzymes of animal origin in the following particulars: Their range of optimum reaction is greater; a reaction neutral to litmus was found to be the optimum one for the majority. The temp. optimum is somewhat lower. Although acting best in a neutral or sometimes in a slightly acid medium they differ from animal trypsin in not being pptd. by safranin. The exoenzymes can pass through a Pasteur-Chamberland filter. The sugar content of the medium has no influence upon the production of proteolytic, exo- and endoenzymes of *Aspergillus niger*. Both exo- and endoenzymes are produced by microorganisms on protein-containing and protein-free media, but the activities of the enzymes from organisms grown on the media containing proteins are greater than those obtained from organisms grown on the protein-free media. The age of the culture at which the most active enzymes are obtained depends on the organism itself, its rapidity of growth, and the nature of the waste products produced in the medium. Fibrin and cryst. egg albumin are decompd. by both the exo- and endoenzymes of the organisms used. Small amts. of  $\text{NH}_3$  were found to be produced in the decompn. of peptone and casein by the proteolytic enzymes of the microorganisms studied. This fact indicates the probable presence of the desamidases among the enzymes produced.

JOHN T. MYERS.

**The differentiation of lactose-fermenting anaerobes from *B. coli*.** REUBEN L. KAHN. U. S. Army. *J. Bact.* 3, 561-4(1918).—Anaerobic lactose-fermenting organisms found in waters of the southeastern area of the U. S. appear to be unable to produce gas when grown anaerobically in Endo medium.

JOHN T. MYERS.

**A simplified confirmatory test for *B. coli*.** U. S. Army. *J. Bact.* 3, 555-60(1918).—K. suggests that Endo slants be employed instead of Endo plates.

J. T. M.

**Non-lactose fermenting bacteria from polluted wells and sub-soil.** I. J. KLIGLER. Rockefeller Institute. *J. Bact.* 4, 35-42(1919).—A study of the biol. and serological characters of the non-lactose-fermenting bacilli isolated from polluted well waters and contaminated sub-soils.

JOHN T. MYERS.

**A rapid method for the identification of bacteria fermenting carbohydrates.** J. BRONFENBRENNER AND M. J. SCHLESINGER. *Am. J. Pub. Health* 8, 922-3(1918).—After pointing out the significance of such a test in sanitary work, the authors outline the method as follows: One prepares medium containing 1.5% of agar, 0.5% NaCl, and 1% peptone. This mixt. is brought to boiling and the reaction not adjusted. At this point a suitable amt. of indicator is added and the medium distributed into small tubes containing 1 or 2 cc. of medium, autoclaved and stored on ice. When used the medium is melted and to it is added 0.1 or 0.2 cc. of a 20% lactose soln. While hot, this medium is deposited in drops on the inner surface of the bottom of a sterile Petri dish. This may be placed symmetrically by marking the outside of the dish. Each of these drops is inoculated from the suspected colonies or material, leaving two drops uninoculated on each plate, as controls. After this a fresh drop of the medium is placed over the inoculated drops, giving conditions of slightly lowered O tension favorable to carbohydrate metabolism of bacteria. In order to prevent the volatilized



acids formed in some drops from causing a color change in other drops, filter paper satd. with NaOH was placed in the top of the Petri dishes. When desired, sterile slides with a concave well may be used. The hollow of the slide is filled with lactose agar, prepd. as outlined above, and a sterile cover glass placed over it. This method greatly decreases the length of time required for the formation of gas.

FRED W. TANNER.

**A simplified fuchsin sulfite (Endo) agar.** MAX LEVINE. *Am. J. Pub. Health* 8, 864-5(1918).—The Endo medium ordinarily used gives variable results in confirmatory work with *B. coli*. In the past much importance has been attributed to the reaction but the work of Clark and Lubs would indicate that this is unreliable as formerly carried out. L. believes that it is preferable to use a medium whose reaction is automatically cared for in its prepn. He proposes the following medium: Distd. water 1000 g.,  $K_2HPO_4$  2 to 5 g., agar 15 to 30 g. Boil these ingredients until dissolved, replacing loss by evapn. with distd. water. The agar is then flaked in definite quantities and autoclaved. Just before use the following materials are added to each 100 cc. of agar: 1 g. or preferably 5 cc. of a 20% soln. lactose;  $\frac{1}{2}$  cc. of a 10 % alc. soln. of fuchsin;  $2\frac{1}{2}$  cc. freshly prepd. sodium sulfite which has been heated for a few min. in the Arnold or brought to a boil over a small flame. After this the medium is used in the usual way.

FRED W. TANNER.

**HIRSCH, PAUL: Die Einwirkung von Mikro-Organismen auf die Eiweisskörper.** Berlin: Gebr. Borntraeger. 256 pp. M. 16. For review see *Pharm. Weekblad* 56, 77(1919).

#### D. BOTANY.

CARL L. ALSBERG.

**The state of the problem of carbon assimilation.** INGVAR JØRGENSEN AND WALTER STILES. *Scientia* 25, 196-207(1919); cf. *C. A.* 12, 2209. E. H.

**Cause of the poisonous action of coal-gas on plants.** C. WEHMER. *Z. angew. Chem.* 31, 1, 205-9(1918); *J. Soc. Chem. Ind.* 37, 745A; cf. *C. A.* 12, 591.—Expts. carried out by W. prove that the injurious action of coal-gas on the growth of plants and germination of seeds (*C. A.* 11, 3300; 12, 591) is due to HCN which is present in minute quantity in coal gas. E. J. C.

**Resin secretion in *Balsamorhiza sagittata*.** ERNEST CARROLL FAUST. Univ. Ill. *Bot. Gaz.* 64, 441-79(1917).—The results are reported of anatomical, ecological and physiol. studies of resin secretion in *B. sagittata*. F. concludes that the resin is a member of the resinic acid group, forming a salt with  $NH_4OH$  similar to that of abietic acid. The resinic acid is formed from a resin which in turn is derived from inulin by polymerization and reduction. The resin is a by-product of the metabolic activities of the plant, and it is probably toxic to the plant. It is stored in special tubes or canals in the endodermal region. T. G. PHILLIPS.

**Application of the biochemical method to the study of the leaves of *Hakea laurina*.** **Extraction of a glucoside (arbutin) and of quebrachite.** EM. BOURQUELOT AND H. HÉRISSEY. *Compt. rend.* 168, 414-7(1919).—*H. laurina* R. Br. is a tree belonging to the family Proteaceae. It is a native of Australia and is cultivated on the Mediterranean coast of France. The hot alc. ext. of 100 g. of the leaves was treated by B.'s method (*C. A.* 5, 967). The following conclusions were reached: (1) The leaves contain sucrose, as do those of all phanerogams. (2) They contain 2 glucosides, one having an index of reduction (cf. *C. A.* 5, 1971-2) greater than 570, the other less than 380. (3) They also contain a levorotatory substance which is not hydrolyzed by emulsin. Two substances were sepd. from the alc. ext. of the fresh leaves, and identified: (1) Quebrachite, or 1-methyinositol, m. 190°,  $[\alpha]_D$  -80.6°. Treatment with

HI gave 1-inositol,  $[\alpha]_D = -64.9^\circ$ . (2) Arbutin,  $[\alpha]_D = -60.5^\circ$ . Treated with emulsin, this gave an index of reduction of 670, calcd. for arbutin 700. Hydroquinone was found in the ether ext. of the hydrolysis mixt. Both of these substances have been found in the leaves of *Grevillea robusta* A. Cunn., a tree belonging to the same family. (Cf. C. A. 6, 1816; 7, 679.) T. G. PHILLIPS.

The temperature coefficient of photosynthesis. W. J. V. OSTERHAUT AND A. R. C. HAAS. *J. Gen. Physiology* 1, 295-8(1919).—The temp. coeff. of photosynthesis in the marine alga, *Ulva rigida*, between  $17^\circ$  and  $27^\circ$  is 1.81. This high figure is explained on the assumption that there occurs first a light reaction with a low coeff. followed by an ordinary reaction with a high coeff. CHAS. H. RICHARDSON.

The distribution and characters of some of the odorous principles of plants (POWER) 17.

## E. NUTRITION.

PHILIP B. HAWK.

### NORMAL.

Comparative metabolism of certain aromatic acids. II. Fate of *p*-hydroxybenzoic acid and *p*-hydroxyphenylacetic acid in the organism of the monkey. CARL P. SHERWIN. Fordham Univ. Med. School. *J. Biol. Chem.* 36, 309-18(1918); cf. C. A. 11, 2923.—"After feeding a monkey (*Macacus rhesus*) *p*-hydroxybenzoic acid 50-60% of it was isolated from the urine as the free acid. When a monkey received 1 g. of *p*-hydroxyphenylacetic acid 32% of it was found in the urine in an uncombined state. After feeding 4.5 g., 48.37% was regained from the urine in an uncombined state while 11.27% occurred (in combination with glycocholic acid) as *p*-hydroxyphenylacetic acid. *p*-Hydroxyphenylacetic acid, found in only a very small amt. by Salkowski and Salkowski (*Z. physiol. Chem.* 7, 171), was obtained in sufficient amts. for analysis and the prepn. of the Cu salt. The process of metabolism of the aromatic amino acids in the monkey is the same as that of the lower animals and different from that of man. The monkey excretes the *p*-hydroxybenzoic acid in the urine in an uncombined state while a partial combination with glycocholic acid takes place in the human organism. The *p*-hydroxyphenylacetic acid is partly excreted as *p*-hydroxyphenylacetic acid in the case of the monkey and lower animals but is excreted in an uncombined form in the urine of man." A. P. LOTHEP.

The influence of protein feeding on the concentration of amino acids and their nitrogenous metabolites in the tissues. H. H. MITCHELL. Univ. Ill. *J. Biol. Chem.* 36, 501-20(1918).—"The main purpose of the expts. was to det. whether or not an increase in the amino-acid concn. of the tissues actually occurred during protein digestion, and, second, to obtain information, if possible, as to the rate of amino-acid catabolism, by investigating the changes in concn. in the tissues of the nitrogenous metabolites of the amino-acids,  $\text{NH}_3$ , and urea. The investigation was undertaken with the conviction that the accumulation of a considerable amt. of data is requisite before satisfactory conclusions can be drawn; the problem is essentially a statistical one. The concn. of amino-acids,  $\text{NH}_3$ , and urea in the tissues of rats is comparable to that of the tissues of other mammals thus far investigated. In the young growing rat the concn. of amino-acid and of  $\text{NH}_3$  in the tissues is considerably higher than in the older animal. In adult rats, protein feeding has only an inconsiderable effect upon the amino-acid concn. of the tissues, while increasing distinctly the urea content. In young growing rats, on the contrary, protein feeding increases considerably the amino-acid and urea content of the tissues, and, less certainly, the  $\text{NH}_3$  content. The  $\text{NH}_3$  and urea content of the livers of rats, both fasting and fed, is in general higher than that of the muscles. The more rapid and general synthesis of proteins in the tissues of the young animal may require at all times a greater concn. of amino-acids and  $\text{NH}_3$ , upon which

to draw, which may be assured by a greater avidity of the tissues for these substances and a less intense catabolism of them than in the adult." The distinct increment in the amino-acid content of the tissues during protein digestion in the vigorously growing animal might be explained in any one of the following ways: (1) "The digestive and absorptive powers of the young organism are more vigorous than of the old, so that of a given protein ration, more is digested and absorbed in a given time, producing a higher amino-acidemia and, by this factor alone, a greater increase in the amino-acid concn. of the tissues. (2) The deaminizing function of the tissues, especially of the liver, in the young animal is less intense than in the old, permitting a greater influx of amino-acids through the portal circulation and a more delayed catabolism in the tissues. (3) The tissues of the young animal possess a greater absorptive power for amino-acids than those of the adult, so that the equil. in amino-acid concn. between tissues and blood is considerably more than 10:1." M. is inclined to the view that unchanged amino-acids rather than the  $\alpha$ -hydroxyl- and keto-acids arising in the metabolism of the amino-acids are responsible for the sp. dynamic action of protein. "It is quite conceivable that the qual. make-up of the amino-acid fraction of a tissue bears some relation to its rate of heat production, quite aside from any change in the size of this fraction. In the postabsorptive period it seems reasonable to suppose that the proteins of the tissue and the free amino-acids and peptides held in it have reached, or approximate to some sort of an equil., which is suddenly disturbed at times when there is an influx of amino-acids from the intestines, constituting a mixt. quite different from that normal to the tissue. This disturbance in tissue equil. may possibly initiate chem. changes leading to an increased tissue metabolism until a readjustment is made as the resultant of catabolic and anabolic transformations, and after several hours an equil. is again established. The fact, as Lusk has shown, that the different amino-acids occurring in proteins have very different sp. dynamic effects, perhaps lends some support to such theoretical considerations." There is no direct evidence that the  $\alpha$ -hydroxyl- and keto-acids exist in the tissues in more than traces and acids of the same type are produced in the metabolism of fatty acids and glucose, substances which have practically no sp. dynamic effect.

A. P. LOTHROP.

**Creatinuria. I. Exogenous origin of urinary creatine.** H. STEENBOCK AND E. G. GROSS. *Univ. Wis. J. Biol. Chem.* 36, 265-89(1918).—"In the pig creatine in the urine may or may not be produced by fasting. Animals giving every external appearance of being normal may or may not have creatine in the urine on such rations as it is customary to feed in good animal husbandry practice. Creatinuria obtained during fasting may be reduced by carbohydrate feeding or by administration of alk., but both treatments applied simultaneously need not necessarily prevent it. In addition acid administration resulting in a slight acidosis may or may not increase the creatine, and protein feeding, if sufficiently intensive, will always produce creatinuria, or if already present will increase it in degree. This effect obtains even during alkalosis and cannot be attributed to acids resulting from the metabolism of the protein mol. We realize fully that our conclusions are at variance with many that have been made on an apparently unimpeachable exptl. basis and we realize also that in the contentions here presented it may appear as though confusion in the study of creatine metabolism has been increased rather than diminished. On critical analysis this shows itself to be far from the case. We are convinced that in one form or another creatine is etiologically related to protein metabolism, whether of exogenous or endogenous origin, and that in addition, in a manner as yet unknown, it is related to the creatine stored in the muscles and other tissues as well. With this fundamental conception it becomes possible to correlate all reliable observations hitherto made on creatine excretion." In S. and G.'s opinion, creatine is an end-product in the catabolism of certain

precursors in the protein mol. just as urea is of others. It might be formed from the splitting of arginine in such a way as to leave the guanidine grouping intact in which case cleavage could occur at the linkage of the C chain with the imino group or the C chain might be deaminized and then oxidized to a 2-C residue, AcOH. In one case guanidine would be formed which would be acetylated as it is exceedingly toxic; in the other case guanidineacetic acid would result and methylation in either case results in the formation of creatine. The great variability in the amt. of creatine excreted under different conditions and the lack of a definite ratio between the total and creatine N may be explained on the basis that the metabolism of creatine precursors may proceed in different directions and that during maintenance and especially during growth, body tissue restitution, and milk production these precursors are utilized and not completely metabolized into creatine. The effect of protein feeding on the excretion of creatine is dependent on the supplementation of amino-acids in such a manner that after the demands of the body are satisfied no creatine precursors are left over to be metabolized into creatine. If creatine precursors are present in excess of the amts. demanded for protein synthesis, the excess is metabolized to obtain energy and part of the N is excreted as waste in the urine in the form of creatine. During excessive endogenous protein metabolism creatine precursors are liberated and creatine appears in the urine. On feeding protein yielding sufficient amts. of those amino acids already destroyed, the creatine precursors are utilized in protein synthesis and creatine disappears from the urine, but if the ingested protein is especially rich in creatine precursors, creatine does not disappear as excessive amts. will be formed from the exogenous protein metabolism. The non-appearance of creatine in the urine when excessive amts. of protein are fed to mature men where there can be no extensive utilization of creatine precursors in tissue construction and where conditions would soon be especially propitious for the formation of large amts. of creatine, must be explained on the basis "that either the metabolism of creatine precursors in these individuals proceeds primarily in another direction from that leading to creatine (with arginine this would mean breaking up the guanidine residue) or that the destructive ability of the individual for creatine is greater. The suggestion is made that the difference in the behavior of men and women in the facility with which creatinuria is produced on the ingestion of protein may be related to the well known variations in the activity of the thyroid and that the relations of the endocrine secretions to creatinuria might well be investigated under carefully controlled conditions.

A. P. LOTHROP.

Hess, Julius F.: *The Principles and Practice of Infant Feeding*. Philadelphia: F. A. Davis Co. \$2.00 net. For review see *Am. J. Public Health* 8, 796(1918).

## F. PHYSIOLOGY.

ANDREW HUNTER.

The significance of undissociated carbon dioxide in respiration. R. W. Scott. Western Reserve Med. School. *Am. J. Physiol.* 47, 43-59(1918).—The slow injection of  $\text{Na}_2\text{CO}_3$  (0.35 g. per kg.) changes the  $P_H$  of the arterial blood from a normal value of 7.4 to 7.8; total arterial  $\text{CO}_2$  is increased 100%, but the free  $\text{CO}_2$  remains at the normal level and the regular type of breathing maintains. It is concluded that: (1) There is no close parallelism between  $P_H$  of the arterial blood and respiration. (2) At slightly alk. levels of  $P_H$ , pulmonary ventilation is so regulated as to maintain the  $\text{CO}_2$  tension in the blood normal. (3) A condition of true alkalosis is accompanied by apnea only when the method used to lower  $P_H$  causes at the same time a sudden fall in the  $\text{CO}_2$  tension. (4) Undissociated  $\text{CO}_2$  acts as a sp. respiratory hormone; therefore, the physiol. effect of  $\text{CO}_2$  on respiration cannot be attributed solely to its acid properties when in soln.

J. F. LYMAN.

## G. PATHOLOGY.

H. GIDRON WELLS AND ANDREW HUNTER.

A note on crystallized gallstones. EDO CLAASSEN. *Am. J. Pharm.* 91, 164 (1919).—C. reports that a number of interesting bodies were passed by a woman, 45 years old. Most of them were small, grain-like; several, however, were of a larger size, up to that of a pea. Their color was yellowish, somewhat shiny; heated on Pt foil they melted at first, then evapd., leaving a little of a dark substance and, when ignited, burned with a yellow flame. They dissolved in hot alc., the soln. leaving four-sided rhombic plates when evapd. on a slide. The largest crystals were polyhedral with a diam. from 6 to 10 mm. and wt. up to 0.384 g. One of these, weighing 0.208 g., surpassed the others by its quite regular shape; it belonged to the regular (the tesseral) crystal system, being a combination of the predominant cube with the octahedron and the dodecahedron = 0000.O.00O., which was proven by measuring the angles by means of a hand goniometer. All the above properties are known to be the same as those of cholesterol.

W. G. GAESSLER.

Serum diagnosis of syphilis. The method of Vernes and syphilimetry. R. DOURIS AND R. BRICQ. Nancy. *Bull. sci. pharmacol.* 25, 321-324(1918).—Elaboration of a technic based on the expts. of Vernes for the serum diagnosis of syphilis. Cf. *C. A.* 12, 2009; 13, 38, 866.

E. S. HAMMETT.

The remote effects of absorption of urine from the colon: A case of traumatic unilateral uretero-intestinal anastomosis. ARTHUR B. CECIL AND ROLAND S. CUMMINS. Los Angeles, Cal. *J. Urol.* 2, 469-80(1919).—Marked toxic symptoms occurred which seemed to be dependent upon absorption of urine from the colon. Great improvement followed an unilateral nephrectomy.

JULIAN H. LEWIS.

The use of a provocative vaccine in determining the cure of gonorrheal urethritis. GERALD H. PEARSON. London, Ontario. *J. Urol.* 2, 455-68(1919). J. H. L.

Alkaptonuria and acetonuria. G. KATSCH. Marburg. *Deut. Arch. klin. Med.* 127, 210-41(1918).—A case of alkaptonuria in a boy 3½ yrs. old is described in which homogentisic acid is made to disappear completely from the urine by fasting. It is noticed that the amt. of acetone in the urine varied inversely with the amt. of homogentisic acid excreted. As aromatic amino acids and their derivs. can give rise to acetone. The author believes that the homogentisic acid is converted into acetone.

JULIAN H. LEWIS.

The connection of milksickness with the poisonous qualities of white snake-root (*Eupatorium urticaefolium*). WALTER G. SACKETT. Univ. Chicago. *J. Infect. Dis.* 24, 231-59(1919).—S. brings forth convincing evidence that "milksickness" or "trembles" of sheep is produced by the ingestion of white snake-root (*Eupatorium urticaefolium*). The poisonous principle can be extd. from the dried leaf powder of the plant with 95% alc. It is toxic for rabbits but not for guinea pigs. J. H. L.

Further observations on antigens used in the Wassermann reaction. E. H. RUXDIGER. Bismarck, N. D. *J. Infect. Dis.* 24, 204-17(1919); cf. *C. A.* 13, 614, 753.—Alc. ext. of dog heart gave 32%, and alc. ext. of guinea pig heart gave 34% positive results with the sera of 50 clinically non-syphilitic patients. Alc. exts. of human, beef and rabbit hearts gave positive results with these same sera. With the sera of known syphilitics the alc. ext. of beef heart and of rabbit heart frequently gave stronger positive results than did the alc. ext. of human heart. The results obtained with the alc. exts. of dog hearts and guinea pig heart corresponded to those obtained with alc. ext. of human heart, while the alc. ext. of sheep heart reacted less strongly. When antigen was added 15 min. after the complement the same results were obtained as when antigen was added 15 mins. before the complement. Antigen dilns. of 1:35,

1:45, 1:50 and 1:75 gave results that were identical with those given by a diln. of 1:25. Dilns. of 1:100, 1:200, and 1:300 gave irregular results, sometimes stronger, sometimes identical with, and other times weaker than those given by a diln. of 1:25. Dilns. higher than 1:300 usually gave weaker positive results than did the diln. of 1:25.

JULIAN H. LEWIS.

**The perfusion experiment in the study of cellular anaphylaxis.** W. P. LARSON AND E. T. BELL. *Univ. Minn. J. Infect. Dis.* 24, 185-90(1919).—A strong evidence of the cellular theory of anaphylaxis is the fact that an anaphylaxis reaction can be obtained in an animal after all its own blood is removed and replaced by that of another animal and that an isolated organ washed supposedly free of blood will give a reaction. The authors' expts. throw doubt on this evidence by showing that it is impossible to wash all the blood out of an organ by perfusion methods. The efferent fluid becomes free from blood and albumin in a short time, but these reappear if the perfusion is temporarily discontinued for a few mins. By perfusing organs with Locke's soln. containing India ink, the course taken by the fluid through the organ was mapped out. It was found that a surprisingly small part of the capillary system is really washed out by the perfusing fluid. This technic does not therefore remove circulating antibodies completely, as has been assumed, and this type of expt. does not establish the presence of cellular antibodies.

JULIAN H. LEWIS.

**Is diabetes mellitus an increase in the formation of sugar or a disturbance of sugar utilization?** S. BERNSTEIN AND W. FALTA. *Wien. Deut. Arch. klin. Med.* 127, 1-46(1918).—In mild forms of diabetes the gaseous metabolism under certain conditions is the same as in normal individuals. During a period when a full diet containing much carbohydrate is given, the respiratory quotient does not rise at first (filling of the glycogen depots); later it does rise, showing that sugar is burned. The increase is very much more marked when on a protein-poor diet. On intravenous injection of sugar the relations are just the opposite from what they are in the normal. There is little or no rise in the respiratory quotient and a glucosuria is produced. Injections of adrenaline lead to a glucosuria but no rise of the respiratory quotient. Injections of pituitary gland ext. cause a lowering of the heat production but no increase in the respiratory quotient. In diabetes of the severest form, it is not possible to increase the respiratory quotient by a carbohydrate-rich diet, by a protein-poor diet, or by intravenous injection of sugar, or by injecting adrenaline or pituitary gland ext. The extra sugar is completely excreted. From these facts it is believed that the metabolic disorder consists primarily of a lower ability of the body cells to take up sugar and to use it and does not consist of an over-production of sugar.

JULIAN H. LEWIS.

**Nature of the substances which play a part in the sigma (Wassermann) reaction.** LOUIS BORY. *Compt. rend. soc. biol.* 81, 128-30(1918).—B. proposes to substitute the word "sigma" for "Wassermann" in designating this reaction. Fixation of complement by syphilitic sera in the presence of an appropriate antigen is due simply to a quant. modification of the proteins of the serum, particularly globulin. This is indicated by the fact that a typical sigma reaction was obtained (without intervention of a sp. serum) by use of Desmoulières antigen, a 2:100 globulin (from horse serum) soln., physiol. NaCl soln. and guinea pig complement; the reaction was negative in the absence of antigen. Serine also plays an important, but less sp. role in the sigma reaction. The sigma reaction is a simple morbid reaction and is not a phenomenon of immunity. Josué, commenting on the above, suggests that the name of this reaction be changed to "Bordet" instead of "sigma."

H. S. PAINE.

**Appearance of precipitins in the serum of rabbits prepared by injections of egg white.** A.-CH. HOLLANDE AND J. GATÉ. *Compt. rend. soc. biol.* 81, 148-51(1918).

—Undild. egg white was subcutaneously injected 9 times (0.5, 1.0 and 1.5 cc. for the 1st 3 and 2 cc. each for the last 6 injections) at 6-day intervals in 2.5–3 kg. rabbits. The serum of the rabbits was examd. 6 days after each injection; pptg. power was detd. in the presence of egg white dild. 1:100, 1:1000, 0.5:1000 and 0.25:1000 with physiol. NaCl soln. Observations on 6 rabbits showed that precipitins first appeared after 30 days, reached a max. in 36 days, decreased after 42 days, and again increased toward the 54th day without attaining the values of the 36th day; individual variations in the different animals were noted. When rabbits received a single injection of 10–30 cc. undild. egg white no precipitins were detected in the serum, even in the presence of a 1:100 egg white soln. and after a period of approx. 2 mos. (examn. every 6 days). When undild. egg white was subcutaneously injected in amts. greater than 5 cc. the sera had little or no pptg. power, even though the injections were repeated every 6–8 days.

H. S. PAINE.

Some chemical examinations of urine and blood in the present gripe. G. PATEIN AND G. COLOMBET. *J. pharm. chim.* 18, 357–63(1918).—In the observation of 20 cases nearly always indoxyl and urobilin were present, as is often the case in infectious diseases. Albumin was not const., often absent, never abundant. The striking feature is the large amt. of urea in urine, confirming Marchadour and Dénier (*Acad. de méd.*, Sep. 10, 1918), who also mention the decrease of eliminated  $\text{Cl}^-$ . The formation of urea is the result of autocombustion, causing high temp. and falling off in wt. It is noted also in other pathol. conditions: Henry Reynès observed in cases of uremia in war wounds 40, 50, 60, 70 g. urea per 24 hrs. in concns. of 30, 35, 40 and 45 g. per l. As to occurrence of urea in blood serum, P. and C. find that while it is slightly above the av., it does not present the same abnormal state as in urine.

S. WALDBOTT.

Proteolytic nitrogen of the exudate of wounds in its relation to secondary sutures. W. MESTREZAT AND MARIANNE ROMME. *Compt. rend. soc. biol.* 81, 1147–50(1918).—The ratio of formol N of proteolysis (of wound exudates) to chlorides is proposed as a criterion for detg. when secondary sutures can safely be performed; since the chloride content of the blood is nearly identical with that of the exudates directly derived therefrom the amount of chlorides found in a compress is practically proportional to the vol. of exudate with which the compress is impregnated. The ratio is applied in the following form: formol index =  $100 \times \text{NH}_3/\text{NaCl}$ . This expression is proportional to the value of the N of proteolysis (autolytic and putrefactive) of the exudate of the wound under the conditions of the examn. and may also be regarded as a coeff. of putrescibility of the fluids of the wound. The detn. is performed as follows: The compresses (after being in place 48 hrs.) are digested  $\frac{1}{2}$  hr. in 100–300 cc. distd.  $\text{H}_2\text{O}$  at room temp. The liquid is filtered through glass wool and to 80 cc. of the filtrate are added 16 g. pure, crystd.  $\text{Na}_2\text{SO}_4$  and 1.5–2.5 cc. of 50%  $\text{AcOH}$  (according to the degree of purulence of the compresses). After heating 10 mins. on a  $\text{H}_2\text{O}$  bath to coagulate albumins the liquid is filtered through paper and the filtrate is used for detn. of chlorides (Charpentier-Volhard method) and formol N (Ronchèse method). A close relationship was observed between the values of the formol index and the results which followed secondary suture. In the case of old wounds of the fleshy parts of the body complete success attended secondary suture when the value of the formol index was less than 10. In the case of recent wounds it was preferable to perform only a secondary suture when the value of the formol index was less than 8.

H. S. PAINE.

The excretion of rest nitrogen and urea in the bile after nephrectomy. E. BECHER. Giesen. *Deut. Arch. klin. Med.* 127, 13–9(1918); cf. C. A. 13, 750.—After nephrectomy there is a vicarious excretion of N through several channels, one of which is the gall bladder. The increased N in the bile after nephrectomy in the dog is less than

that in the blood; the increased hypobromite N is about the same. The % of the amt. of retained N which is excreted in the bile is small. JULIAN H. LEWIS.

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

**Experimental research on the effect on the gastro-intestinal tract of the excretion of poisons, considering the age of the animals.** N. OKUBO. *Am. J. Dis. Children* 16, 376-87(1919).—The animals used were: rabbits, dogs and chickens, grown and very young, besides grown white rats and pigeons. The substances tested were injected subcutaneously and intravenously. They were: colloidal Bi, HgCl<sub>2</sub>, colloidal Ag, As<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, ricin, cantharidin, snake poison, emulsions of Shiga bacilli, paratyphoid B, typhoid and cholera bacilli. Three characteristics are pointed out with regard to the excretion of poisons in the intestinal tract of very young animals. (1) The excretion takes place diffusely and is consequently thinned. (2) The enteritis by excretion is anatomically of a diffuse character and less sp. to every poison offered. (3) The destructive process is relatively distinct in regard to the histol. findings, showing a diffuse epithelial alteration, while the reactive process is slighter in comparison with findings in grown animals. S. AMBERG.

**Cesium ions and heart activity.** [Biological antagonism between K, Rb, Cs and U, Th, Ra, Ra Em.] H. ZWAARDEMAKER. *Vers. Akad. Wetenschappen Amsterdam* 26, 776-81(1918).—An excized frog heart can be kept beating by replacing the KCl of Ringer soln. by either (A) CsCl or RbCl (40-80 mg. per l.) or (B) radioactive salt, namely UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub> or UO<sub>2</sub>(OAc)<sub>2</sub> (1-6 mg. per l.) or Th(NO<sub>3</sub>)<sub>4</sub> (2-10 mg. per l.) or Ra salt (less than 3<sup>-4</sup> mg. per l.) or Ra emanation (less than 100 Mache units). The action of the salts A (to which also belongs KCl) is balanced by the salts B; if both are present in proper concn. the heart will be at rest; if one is present in excess the heart will beat again. Thus, e. g., a heart beating with CsCl (40 mg.) (= Cs-beating) comes suddenly to rest with Th(NO<sub>3</sub>)<sub>4</sub> (20 mg.) (= Cs-Th-equil.) and resumes beating (= Th-beating) again after 25 min. Compare also K-U-equil. in *C. A.* 11, 3058. The addition of fluorescein (100 mg. per l.) shifts the equil. (cf. *C. A.* 12, 2621), for a heart at rest by the presence of both (A and B) will resume beating. Fluorescein sensitizes the heart more for the influence of B than for A. Cs (like K and Rb) very probably emits β-rays, upon which its activity depends. Also in *Proc. Acad. Sci. Amsterdam* 20, 773-8(1918).

I. W. D. HACKH.

**The influence of hydrogen peroxide on the peristalsis of the isolated intestine.** H. J. HAMBURGER AND E. BROUWER. Univ. Groningen. *Vers. Akad. Wetenschappen Amsterdam* 26, 791-4(1918).—The rhythmic movements of intestines of rabbits suspended in Tyrode soln. are not changed by altering the flow of O through the soln. Addition of H<sub>2</sub>O<sub>2</sub>, however, increases the activity for a definite time period, after which the normal rhythm is again resumed. This is also observed in the presence of a narcotic (like CHCl<sub>3</sub>). A repeated dose of H<sub>2</sub>O<sub>2</sub> produces a weaker effect than the first one. The lowest concn. of H<sub>2</sub>O<sub>2</sub> causing a distinct reaction was 1:1,300,000. With a relatively high concn. (1:15,000) the contractions became smaller and smaller and finally ceased entirely, but by placing the intestines in a new Tyrode soln. the contractions slowly returned. It is probable that the substances necessary for the peristalsis are decomposed by H<sub>2</sub>O<sub>2</sub>. Also in *Proc. Acad. Sci. Amsterdam* 20, 861-4(1918).

I. W. D. HACKH.

**Physiological actions of essential oils.** S. FURUKAWA. *Tokyo Kwagaku Kwaishi* (*J. Tokyo Chem. Soc.*) 40, 42-59(1919).—Soly. of the oils in H<sub>2</sub>O, blood serum and milk serum and also the minimum concn. of the substances in aq. soln. at which a loach is killed were detd. The soly. of the substances in the 3 solvents is observed to



be the same. Values are: amyl alc. 0.4% (0.1% min. concn.), octyl alc. 0.03% (0.002%), decylol 0.0075% (0.0018%), citral 0.001% (0.0032%), citronellal 0.0005% (0.0028%), Me salicylate 0.013% (0.0067%), Et salicylate 0.010% (0.0039%), Pr salicylate 0.0006% (0.0037%), Bu salicylate 0.0003% (0.0041%), Am salicylate 0.00015% (—), phenol 0.5% (0.0045%), cymene 0.02% (0.0017%), carvacrol (0.0014%). From the data F. discussed the theory of narcosis. S. KOMATSU.

**The absorption of drugs and poisons from the ureter and pelvis of the kidney.** DAVID I. MACHT. Johns Hopkins Hosp., Baltimore. *J. Urol.* 2, 491-6(1919); cf. *C. A.* 12, 1215, 1488.—It seems that aconitine, cocaine, apomorphine and KCN are easily absorbed through the walls of the ureter and kidney pelvis. These findings are not only of theoretical scientific interest but are also of some practical importance and should be borne in mind by the practical urologist inasmuch as various drugs such as Ag compds., Th, etc., are introduced into these organs for diagnostic and therapeutic purposes. JULIAN H. LEWIS.

**The toxicity of cresylic acid.** ANNIE HOMER. *Proc. Physiol. Soc., J. Physiol.* 52, xxxiv(1918).—Cresylic acid dissolved in saline or serum adjusted to  $P_H$  6.6-7.0 may produce only a transitory effect in mice and guinea pigs when the same amt. in solns. adjusted to  $P_H$  8.3 may be fatal. When trikresol is used as an antiseptic in serum care should be used in selecting ampoules and bottles of a suitable quality of glass from which little or no alkali can be dissolved. J. F. LYMAN.

**Chemical stimulation of cerebral cortex.** S. S. MAXWELL. *Am. J. Physiol.* 47, 283-5(1918).— $NEt_4Cl$ , unlike other substances which stimulate medullated nerve, is also a stimulant of gray matter. J. F. LYMAN.

**Use of antiseptics in the treatment of infected wounds.** MAURICE CAZIN AND S. KRONGOLD-VINAVER. *Compt. rend. soc. biol.* 81, 1214-7(1918); cf. *C. A.* 12, 953.—C. and K. report results obtained with various antiseptics. The bactericidal action of  $AgNO_3$  in 1:200,000 soln. was only manifested in wounds with flora composed principally of the pyocyanic bacillus or staphylococci associated with diplococci and similar bacteria.  $AgNO_3$  in this concn. had a very favorable influence on proliferation of tissue.  $NaClO$  solns. prepd. according to Dakin or Daufresne so as to contain 5:1000 of  $NaClO$  were too caustic, as was distinctly shown by histological examn. of fragments of human skin after 2 hrs. contact with the soln. Javel soln. dild. in the proportion of 15 g. to 1 l. of  $H_2O$  contained only 0.427:1000 of  $NaClO$  and had no injurious action on human tissues (even after 24 hrs. contact). The dild. Javel soln. had greater bactericidal power than Dakin soln. and was particularly active in the case of wounds infected with anaerobes; sp. action on this group of bacteria was observed in a large no. of instances. In a no. of cases of particularly serious gangrenous wounds direct antiseptic action was effected by subcutaneous injections of Weinberg vaccine (against *B. perfringens*). In streptococcic infections the indirect bactericidal action of Leclainche and Vallée polyvalent serum yielded excellent results; its efficacy was slight in *B. perfringens* and septic vibrio infections. The above results emphasize the selective action of various antiseptics on bacteria. Disinfection of wounds should be systematically regulated according to the bacterial flora as detd. from day to day. H. S. PAINE.

**Use of solutions of sodium fluoride and cadmium sulfate for disinfection of war wounds.** PIERRE PHILARDEAU. *Compt. rend. soc. biol.* 81, 1228-30(1918).—P. studied the antiseptic action of a 4:1000  $NaF$  soln. and a 0.40:1000  $CdSO_4$  soln. on recent wounds which were treated with Dakin soln. prior and subsequent to these expts.; these concns. are greatly in excess of those which were found by Richet and Cardot to have a pronounced bactericidal action on lactic acid bacteria *in vitro*. Intermittent irrigation of the wound was practised for 10 days. The antiseptic action was unsatis-

factory; no intoxication or local irritation was observed.  $\text{NaF}$  produced an abundant fibrinous exudate which protected the bacteria from the action of this compd.;  $\text{CdSO}_4$  was less objectionable in this respect. The particular merit of Dakin's soln. consists in its action on exudates and the rapid liquefaction and elimination of protein material in process of necrosis; this is followed by disappearance of bacteria.

H. S. PAINE.

**Use and applications of chlorinated alum solution; general considerations relative to antiseptics.** W. MESTREZAT. *Compt. rend. soc. biol.* 81, 1211-4(1918); cf. C. A. 13, 232, 483.—M. makes the following classification of chem. compds. and products used in the treatment of wounds: (1) those (such as horse serum, physiol.  $\text{NaCl}$  soln., etc.) which permit free exercise of the local and general means of defense of the organism; (2) those which reinforce one or more of these natural means of defense; (3) those which have a peculiarly selective action (action on toxins, etc.). Chlorinated alum soln. belongs to the 2nd class and has a different action from the chlorinated solns. usually employed in that it provokes a considerable flow of lymph to the wound (comparable to that produced by hypertonic sera). It has an energetic detergent action and produces at the expense of the diseased tissues a coagulated and imputrescible magma which is eliminated on the compresses. It has a pronounced bactericidal action in addition to the above.

H. S. PAINE.

**Sapidity and stereoisomerism.** FRANÇOIS BARRAL AND ALBERT RANC. *l'Industrie chim.* 5, 279-81(1918).—The authors compare the stereoisomeric amino acids as regards their effect upon the sense of taste. Thus, *d*-phenylalanine and *d*-histidine are sweet, whereas the *l*-compds. are bitter. *d*-Tryptophan is tasteless, *l*-tryptophan slightly bitter in taste, and the racemic mixt. of the two is sweet. Several other similar instances among the amino acids are cited. No explanation for this phenomenon is given.

M. P.

**Action of antiseptics on the virulent bacteria of the rhinopharynx.** H. MÉRY AND LUCIEN GIRARD. *Compt. rend. soc. biol.* 81, 1251-2(1918).—M. and G. detd. the effect on mice (subcutaneous injection) of the rhinopharyngeal mucus of school children before and after treatment of the latter with 1:100 collargol (introduction through the nostrils so as to bathe the rhinopharynx); the mice died of pneumococcic septicemia in both cases. Similar results were obtained when gomenol was used instead of collargol. Treatment of the rhinopharynx with these antiseptics reduced the no. of bacteria but did not diminish the virulence of those which survived. The difference in the action of collargol and gomenol *in vitro* and *in vivo* is probably due to mechanical protection of the bacteria by mucus, folds of the mucosa, etc. These results explain the prevalence of pneumococcic infections in epidemics of influenza in spite of all the precautions which were observed.

H. S. PAINE.

**Present status of the question of the use of antiseptics.** PAUL CARNOT. *Compt. rend. soc. biol.* 81, 1166-92(1918).—C. discusses the question of the use of antiseptics in all its phases and especially the advance in knowledge of this subject which was made during the war (particularly with reference to the treatment of wounds). A large proportion of the antiseptics which were used with success during the war were only slightly bactericidal *per se* and apparently produced their effects indirectly through secondary chem. transformations on contact with the organism or parasitic microorganisms or through stimulation of the natural defensive reactions of the organism. The future course of the development of antiseptics should be directed along this line and also along the line of systematic study of a series of chem. compds. which should be modified by introduction of groups and chains with sp. action on bacteria and little or no injurious effect on the tissues.

H. S. PAINE.

BAYLISS, W. M.: *Intravenous Injection in Wound Shock*. London: Longmans, Green & Co. 172 pp. 9s. net. For review see *Scientia* 25, No. LXXXIII-3, supplement VII.

DELBET, PIERRE AND FIESSINGER, NOEL: *Biologie de la plaie de guerre*. Paris: Félix Alcan, 108 Boulevard St.-Germain. 460 pp. F 30. For review see *Rev. sci.* 57, 95(1919).

MARFORI, PIO: *Trattato di farmacologia e terapia*. 2nd Ed. Napoli: Luigi-Pierro, Piazza Dante, 76. 783 pp. F. 25. For review see *Rev. sci.* 57, 128(1919).

## 12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Detection of decomposition in foods. K. BRAUER. *Chem. Ztg.* 42, 421-2(1918); *J. Soc. Chem. Ind.* 37, 668A.—Incipient decompn. in sausages, preserved foods, etc., can be detected by inoculating dextrose-bouillon with a small portion of the sample, incubating at 38° for 24 to 48 hrs., and noting whether or not gas is produced during this period. If there is formation of gas, organisms capable of decomposing the food are present; further investigation by sub-cultures will, if desired, indicate the kind of organism. The dextrose medium employed is prepd. by dissolving 1 g. of meat ext. in 100 cc. of water, adding 1 g. of peptone and 0.5 g. of NaCl, sterilizing the soln., then adding 1 g. of dextrose, introducing portions of the soln. into a series of Einhorn fermentation tubes, and again sterilizing for a short time. E. J. C.

Analysis of commercial saccharin. II. The detection and estimation of impurities. H. DROOP RICHMOND AND CHARLES A. HILL. *J. Soc. Chem. Ind.* 38, 8-107 (1919).—The tests given in the U. S., British, and French pharmacopeias are in no instance specific for any impurity. The loss on drying in the water oven is taken as moisture, although if the sample is damp a minute portion of the saccharin (*s*) will be hydrolyzed. Moistening 1 g. *s* with 1 cc. H<sub>2</sub>O after each successive 2 hrs. heating showed steady increases in wt. Boiling with H<sub>2</sub>O showed 97.4% hydrolyzed in 96 hrs. and contact with H<sub>2</sub>O at room temp. showed 17.6% hydrolyzed in 166 days. In ashing it is advisable to heat gently to volatilize *s*, leaving the mineral matter. Strong heating at first will produce C, difficult to burn off. Acetone will dissolve *s*, leaving mineral impurities. Heat 1.5 g. *s* with 10 cc. of 70.5% H<sub>2</sub>SO<sub>4</sub> so that the liquid boils in 1 min. Boil for 1/2 min. exactly and pour into 15 cc. H<sub>2</sub>O (cold). "Seed" with a trace of *p*-sulfoaminobenzoic acid and place in ice H<sub>2</sub>O. If 1% of para acid is present crystals form in 1/2 hr.; if 3% is present they usually form on cooling before seeding and 10% begin to sep. while still hot. This test is believed more reliable for the *p*- acid than 4 others which are discussed. A table of solubilities of *s* and *o*- and *p*-sulfoaminobenzoic acids is given as the basis for the detection of the *o*- acid which is an unlikely impurity. A method is given for *o*-toluenesulfonamide, but good com. *s* contains only small traces of this. Methods for Pb and As are given. As *s* is hydrolyzed (with lowering of m. p.) on drying little importance is given to the m. p. test although official in U. S. and French pharmacopeias. The U. S. P. test for NH<sub>3</sub> is not very delicate. Nessler reagent is recommended. NH<sub>3</sub> is practically never found except in traces (below 0.01%). The boiling with 70.5% H<sub>2</sub>SO<sub>4</sub> for *p*-acid above shows easily carbonizable org. matter by brown coloration. Na<sub>2</sub>CO<sub>3</sub> 0.05 g. and *s* 0.1 g. in 1. of H<sub>2</sub>O can be compared with 5% sucrose soln. and on diln. the sweetness of *s* can be estd. to within 5%. No tests for salicylic and benzoic acids or glucose and milk sugar are given. Cf. C. A. 12, 2215. H. A. LEPPER.

**Use of hydrofluoric acid for preserving fruit juices.** A. BEYTHIEN AND P. PANNWITZ. *Z. Nahr. Genussm.* 36, 116-9(1918); *J. Soc. Chem. Ind.* 38, 25A.—HF and sol. fluorides have distinctly poisonous properties, and the use of the acid as a preservative for fruit juices is dangerous to health. The added HF cannot be removed completely by the addition of  $\text{CaCO}_3$  in quantity slightly larger than that required by theory, and if more than this quantity of  $\text{CaCO}_3$  is added, the quality of the fruit juice is affected.

E. J. C.

**Determination of carbon dioxide and carbonate in baking powder.** G. RUFF AND E. WOHLNICH. *Z. Nahr. Genussm.* 36, 101-10(1918); *J. Soc. Chem. Ind.* 38, 25A.—To ascertain the available  $\text{CO}_2$  and excess  $\text{NaHCO}_3$  in a baking powder, detns. are made of the total  $\text{CO}_2$  and the amt. remaining after a portion of the sample has been boiled with water for 30 min.; the difference between the 2 detns. gives the available  $\text{CO}_2$ . In the case of baking powders contg.  $\text{CaCO}_3$  in addition to  $\text{NaHCO}_3$ , the mixt. after boiling, must be filtered and the  $\text{CO}_2$  detd. both in the insol. portion and in the filtrate. All the detns. are made in a Keissler-Erdmann  $\text{CO}_2$  app.

E. J. C.

**Digestion of aleurone cells incorporated in bread as now made.** L. LAPICQUE AND A. LIACRE. *Compt. rend. soc. biol.* 81, 217-20(1918).—Flour mixed with  $\text{H}_2\text{O}$  and baked at  $100^\circ$  was fed to mice; the feces of the latter contained aleurone cells which were practically intact. When unmodified flour was fed to the mice the feces contained empty as well as intact aleurone cells, this being probably due to fracture of the envelope of the cells (thus permitting digestion of the contents) during mastication, whereas the baked flour paste was swallowed with little or no mastication. Examn. of French war flour after the latter was washed free of starch showed the aleurone cells to be all practically intact. The feces of man, mice and dogs after ingestion of bread made from this flour contained, however, very few intact aleurone cells; practically all of these cells had been ruptured during panification (as shown by microscopical examn. of the bread) and the contents had been digested. The aleurone cells remained intact in flour which had been simply mixed with  $\text{H}_2\text{O}$  and heated at the b. p. for  $\frac{1}{2}$  hr. The same was true when the mixt. was subjected to fermentation by yeast before heating. The rupture of the aleurone cells during panification is attributed to fracture of the envelope of the cells during remilling of the bran which is used in producing war flour and to the subsequent action of forces of traction and torsion in the glutinous mass during the processes of kneading and fermentation; the effect of these forces on the fractured envelopes of the aleurone cells which are imbedded in and adhere to the mass of dough is relatively powerful. There is no doubt, therefore, that as war flour is now prepd. most of the aleurone cells are digested and contribute to the food value of the bread. This utilized material constitutes about  $\frac{1}{3}$  of the portion of the flour which has heretofore been regarded as not possessing human food value. In an 85% flour containing 4-6% of aleurone envelopes this increase amounts to 1-2% of the total food value. The rupture of the aleurone cells is only effected during panification, however, in case the envelopes have been previously fractured during the milling process; such fracture is attributed primarily to remilling of the bran.

H. S. PAINE.

**The measurement of the acidity of bread.** EDWIN J. COHN, P. H. CATHCART AND L. J. HENDERSON. Harvard Univ. and Med. Dept., U. S. Army. *J. Biol. Chem.* 36, 581-6(1918).—"The degree of acidity is of importance in bread making in that it det. the physical state of the gluten, influences the growth and the activity of the yeast, and controls the growth of many other microorganisms, such as the rope-producing bacillus, *B. mesentericus*. The growth of the yeast and other microorganisms in turn influences the acidity of dough and of bread." A colorimetric method for measuring the relative acidity of bread is described in which the H-ion concn. is measured by means of the color produced when an ordinary indicator soln. of methyl red is allowed to fall

upon a slice of bread. The color produced varies from orange to red corresponding to initial values of  $P_H$  ranging from approx. 6.0 to 4.5. If the loaf is ropy, the color will be yellow due to the alkali produced in the metabolism of *B. mesentericus*. The H-ion concns. of suspensions of bread run closely parallel with the colors produced on the cut surface by the addition of methyl red. "The loaf is cut cleanly, and upon a point near the center of the loaf 4 drops of a 0.02% soln. of the indicator in 60% alc. are allowed to fall. After waiting 5 min. the color is observed. By comparison with a color chart or with a loaf of bread of known acidity, the H-ion concn. of a loaf of bread may be estd." The H-ion concns. of 54 loaves from the largest Boston bakeries varied from  $P_H = 5.01$  to 5.7.

A. P. LOTHROP.

German (prisoners of war) bread. W. PARTRIDGE. *Analyst* 44, 48(1919).—Analysis of one sample is given. Small yellowish particles embedded in the crust showed the structure of finely pulverized wood.

H. A. LEPPER.

Zeiss butyro-refractometer: The conversion of scale readings to refractive indices. J. F. LIVERSIDGE. *Analyst* 44, 48(1919).—The formula given by Roberts for the calcn. of  $n_D$  from the scale reading (C. A. 11, 410) is inconvenient for the converse. L. recommends as more convenient: scale reading =  $287.3 - \sqrt{97,966 - 703,235(n_D - 1.4)}$ .

H. A. LEPPER.

Some observations on the efficiency of the present standard agar for the estimation of bacteria in milk. H. J. SEARS AND LULU L. CASE. *J. Bact.* 3, 531-6(1918).

JOHN T. MYERS.

Methods of calculating added water in milk. LESLIE J. HARRIS. *Analyst* 44, 43-5(1919).—A table is given from which added water in milk can be calcd. when fat and solids-not-fat are known. The table is based on a formula previously derived (C. A. 13, 147). Directions are given for making an alignment chart or slide rule to simplify calcn.

H. A. LEPPER.

The fat-free dry residue of milk. N. SCHOORL. Utrecht. *Pharm. Weekblad* 55, 1645-64(1918).—The direct detn. of the dry residue of milk may give results which vary as much as 0.5%, on account of variations of manipulation by different investigators. Of the numerous formulas in use for calcg. the residue, all are about equally accurate; but each is limited to particular conditions of analysis. There should be an official standard method of analysis, and a corresponding formula for calcn. For this purpose, preference is given to the formula of Moeslinger:  $D_{ff} = (S + V)/4$ , or  $D = (S + 5V)/4$ , where  $D_{ff}$  is the fat free dry residue,  $D$  the dry residue,  $V$  the fat content and  $S = 1000$  (sp. gr. of milk - 1), which is the lactodensimeter unit. If the fat and sp. gr. detns. were uniformly carried out in conformity with this formula, the calcn. of the dry residue would be simple and sufficiently accurate. In judging the quality and nature of milk, this value is as important as that of the f. p. depression.

JULIAN F. SMITH.

Cooling milk and storing and shipping it at low temperatures. J. A. GAMBLE AND J. T. BOWEN. U. S. Dept. Agr., *Bull.* 744, 28 pp.(1919).—Expts. were conducted to det. (1) the relative efficiency of cooling tanks of different construction handled under varying conditions, (2) the most efficient method of cooling and storing milk on the farm, and (3) the transportation of milk at low temps. to market. Milk should be kept at a temp. of 50° or below in order to maintain its quality. The cork-insulated tank was found most efficient for the cooling of milk. The felt jacket or insulated cans proved very efficient in keeping milk during long shipments in hot weather and in preventing freezing during cold weather.

J. J. SKINNER.

Determination of water in margarine by heating in aluminium beakers. J. PRESCHER. *Z. Nahr. Genussm.* 36, 70-1(1918); *J. Soc. Chem. Ind.* 37, 746A.—The

usual method of detg. water in margarine by heating the sample in an Al beaker until the water has been evapd. presents some difficulty in the case of margarine as now sold in Germany. Excessive spurting takes place, probably owing to the presence of traces of soap (from the purification of the crude fats) and of potato starch; the soap appears to coat the starch granules and the steam escapes violently. Distn. with xylene or drying on sand in the water-oven is recommended in the case of such samples.

E. J. C.

**Fat extraction apparatus.** E. GRIFFITHS-JONES. *Analyst* 44, 45-7(1919); illus. —The thimble is attached to the end of a vertical condenser with a cork and is surrounded by a flask containing the solvent also attached to the condenser. A side tube parallel with the condenser leads from solvent flask to interior of condenser to level of  $H_2O$  intake. This app. was found more rapid than the Soxhlet.

H. A. LEPPER.

**Preservation of liquid eggs with boric acid.** A. W. J. MACFADDEN. *J. Soc. Chem. Ind.* 38, 50R(1919).—A review of the report of the work of the inspectors of foods 1917-18. Liquid eggs imported into England from China were found to contain 1.35-2.08% of  $H_3BO_3$  which is considered excessive. Packages containing an equiv. of 9-12 eggs designed for home use contained 40-113.4 grains per lb. Public health authorities have made it a condition on importation that the importer guarantee the eggs to be sold only to bakeries and confectioners where their use will only introduce negligible amts. of  $H_3BO_3$  and that they be not sold in small retail packages (under 7 lbs.) to consumers.

H. A. LEPPER.

**Formaldehyde in smoked meat.** M. ISHIO AND S. AOKI. *Yakugaku Zasshi (J. pharm. soc. Japan)* 443, 20-40(1919).—On testing 20 smoked meats obtained from Japanese markets, the authors observed that they contain  $1/10000$ - $1/10000$  HCHO. As regards the test for HCHO, they are of the same opinion as Kawahata and Namba (*C. A.* 12, 1217).

S. KOMATSU.

**Castor bean meal.** ANON. *J. Board Agr.* 24, 1444(1918); *Bull. Imp. Inst.* 16, 395(1918).—Trials were carried out to det. whether the residue of castor beans, after the removal of the oil, can be used satisfactorily for the feeding of pigs, and in particular to ascertain whether the toxic properties of the residue, which are due to ricin can be removed by submitting the material to a high temp. The heating process was carried out by the manufacturers but the temp. employed is not mentioned. The pigs refused to eat the meal when merely mixed with  $H_2O$  or with treacle. When the meal was given with house-wash of good quality which had been boiled and mixed with other meals, a considerable amt. was consumed with good results. In no case was any symptom of poisoning observed.

R. L. SIBLEY.

**Experiments with bolly refuse.** C. T. DOWELL AND W. G. FRIEDEMANN. Oklahoma Agr. Expt. Sta., *Bull.* 121, 2-8(1918).—Two steers were not only maintained but also gained in wt. with no impairment of health in a digestion expt. of 3 weeks on a lot of bolly refuse (material remaining from the ginning of bollies, partially opened or unopened bolls of cotton) from the Coyle Gin Co. The chem. compn. of this sample on the moisture-free basis was dry matter as weighed out 88.79, ash 5.77, protein 9.97, fiber 41.55, N-free ext. 40.30, and fat 2.41%; the mechanical analysis gave cotton 9.76, seed 15.5, and burrs 74.74%. This bolly refuse served as a good roughage on account of its large amt. of digestible carbohydrates resulting from the high % of unginned cotton. The bolly refuse from the Coyle Gin Co. was used by farmers as a cattle feed. The bolly refuse from the Thompson Gin Co. showed considerable variation in compn., due to closer ginning and was not used as a cattle feed but only as a fuel under the boilers of this gin. The mechanical compn. of a sample taken from this gin was cotton 3.87, seed 4.06, and burrs 92.07%. The ash from bolly refuse contains valuable

fertilizing constituents. One sample of bolly refuse ash (Thompson) contained  $P_2O_5$  7.45,  $K_2O$  32.01, and  $CaO$  12.27%. Another sample (Coyle) contained  $P_2O_5$  6.42,  $K_2O$  26.14, and  $CaO$  8.69%. One thousand lbs. of the bolly refuse from the Coyle Gin Co. contained  $P_2O_5$  3.30 lbs.,  $K_2O$  13.40 lbs., and  $CaO$  4.40 lbs. Analyses of the seed from bollies, and of the oil cake from bolly seed, showed that the seeds were of inferior quality, especially with reference to the oil content of the seed, and that the 2 samples of oil produced from bolly seed examd. were of low grade. W. G. F.

**Chopped soapweed as emergency feed for cattle on southwestern ranges.** C. L. FORSLING. U. S. Dept. Agr., *Bull.* 745, 20 pp. (1919).—Soapweed (*Yucca elata*) is a valuable feed so far as its chem. analysis is concerned. It occurs abundantly on the southwestern ranges, from western Texas to southern Arizona. It is higher in crude fiber and ash than fresh green alfalfa, immature corn silage, and fresh green timothy; the comparison in the amt. of ether ext., protein, and N-free ext. is favorable enough to indicate a good stock feed. Feeding expts. demonstrate that soapweed, with a supplemental ration of cottonseed meal or similar concentrates is practicable as a means of maintaining range cattle in time of drought. From 15 to 20 lbs. of chopped soapweed with 1 to 1.3 lbs. of cottonseed meal daily will maintain a cow. There was no accumulative ill effects on the digestive tract of cattle fed on soapweed over a long period, neither was there any harmful purgative effect except occasional scouring. J. J. SKINNER.

Saponifiable fat and total fat (PRESCHER) 27. Utilization of residues from Brunswick beer (REINKS) 16. Action of ozone on various bacteria, yeasts and molds (HEISE) 11C. The baby milk bottle a possible cause of lead poisoning (GUERBET) 19. Forage poisoning (GRAHAM, BRUECKNER) 11C.

**Apparatus for desiccating milk.** C. H. CAMPBELL. U. S. 1,292,577, Jan. 28.

**Coffee extract.** W. A. HAMOR and C. W. TRIGG. U. S. 1,292,458, Jan. 28. In prepg. an aromatized coffee ext., volatilized caffeol is brought into contact with an absorbing medium such as petrolatum and the caffeol is then extd. from this absorbing medium by the use of alc.,  $CCl_4$  or other solvent, and the caffeol thus recovered is added to a concd. coffee ext. for use in making a beverage.

## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

**A ready method for the extraction and estimation of dissolved gases in water.** F. W. RICHARDSON. *J. Soc. Chem. Ind.* 38, 32-3T.—“A stout glass bottle is completely filled with water. The lower tube of a bulb or thistle funnel head, of 50 cc. cap, and provided with 2 stoppers, as described in *C. A.* 4, 2590, is passed through a rubber stopper, the bulb is evacuated, and the stopper inserted into the bottle, thereby connecting the tube with the water. When the lower tap of the bulb is opened a little of the water rushes up, and it becomes possible to press the cock firmly into the bottle neck. Evolution of gas at once begins. If the bottle is placed in a vessel of water at about  $40^\circ$  and the gases are occasionally removed from the small bulb, the water will continue to boil until all gases have been removed.  $CO_2$  is tenaciously held by water, and when it is present alone repeated evacuations of the small bulb are necessary, but a number of experiments have proved that  $CO_2$  can be completely removed in the apparatus.” If the water contains much dissolved air in proportion to  $CO_2$  the latter is more easily removed. ERLE M. BILLINGS.

BERGERY, D. H.: *The Principles of Hygiene: A Practical Manual for Students, Physicians and Health Officers*. 6th Ed. Thoroughly revized. Philadelphia and London: W. B. Saunders Co. 543 pp. \$3.50 net. For review see *Philippine J. Sci.* 13B, 332.

A biochemical study of the plankton of Lake Mendota (SCHUETTER) 11C. Centrifugal pumps for dealing with liquids containing solid, fibrous and erosive matter (PARSONS) 1.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

**Saline soils and their improvement.** K. K. GEDROIC. Reprint, 1-16 pp.; *J. Soc. Chem. Ind.* 37, 598A.—G. describes the treatment necessary for the improvement of soils contg. excess of neutral salts, such as the so-called white alkali land, and those contg. soda, such as the black alkali land. E. J. C.

**Nitrification. II. Intensive nitrite formation in solution.** AUGUSTO BONAZZI. Ohio Agr. Exp. Station. *J. Bact.* 4, 43-59(1919).—The ordinary Omelianski soln. for the growth of the nitrite former studied will support a very abundant growth of this organism as measured by the production of the by-product of its growth,  $\text{HNO}_2$ , or its salts. The conditions under which this luxuriant growth was produced were shallow layers of the soln., slow rotary movement of the culture, and a temp. of  $25^\circ$  to  $30^\circ$ . The growths reported are far in excess of any previously reported for equal periods of time in soln. cultures. It would seem that better aeration may not be the only factor contributing to intensive nitrification, but that change of local environment is in some way associated with it. This assumption throws a new light on the study of conditions favoring growth in the solns. Whether this change of environment, if it proves to be actually operative, is associated with removal of by-products or better access of mineral nutrients, or possibly some other factor must be detd. by subsequent work. Numerous references are appended. JOHN T. MYERS.

**Nitrates, nitrification, and bacterial contents of five typical acid soils as affected by lime, fertilizer, crops and moisture.** H. A. NOYES AND S. D. CONNER. Ind. Agr. Expt. Sta. *J. Agr. Research* 16, 27-42(1919); cf. *C. A.* 12, 1808.—Two series of expts. were carried out with 5 types of acid soils, in one series the soils being treated with  $\text{CaCO}_3$ , acid phosphate, or complete fertilizer, and cropped with wheat or clover, while in the other the soils were uncropped and kept at  $1/4$ ,  $1/2$ , or full, moisture content. The results reported are acidity, crop yield (first series), nitrates when sampled and after, six weeks' incubation with  $(\text{NH}_4)_2\text{SO}_4$ , and numbers of aerobic, anaerobic and  $\text{CO}_2$ -surviving bacteria. All the soils were acid, the acidity being much reduced after the application of lime. The use of  $\text{CaCO}_3$  greatly increased nitrification in all soils as also did complete fertilizer to a lesser degree. Cropping with clover kept down the nitrate content. Soils kept  $1/2$  satd. with  $\text{H}_2\text{O}$  showed higher nitrifying power than those kept  $1/4$  satd., while those kept fully satd. were devoid of nitrates and showed no nitrifying power. The use of  $\text{CaCO}_3$  greatly increased the number of bacteria, especially the aerobes and small increases resulted from the use of complete fertilizer. Soils kept  $1/2$  satd. had the largest number of aerobes while the number of anaerobes was highest in the fully satd. soils. In general there was a close parallelism between the number of aerobes and the nitrifying power. R. N. HARGER.

**Manufacture of artificial fertilizers in the Dutch East Indies.** VAN REYERSBERG VERSLUYS. *Meded. v. d. Comm. tot Ontw. v. d. Fabrieksnijverheid in Ned. Indië* 1917,



No. 3; *Chem. Weekblad* 16, 78-9(1919).—A discussion of natural resources and possibilities of manuf. of fertilizers in the Dutch East Indies. Nothing is known as to phosphate deposits. Potash probably occurs, and some potash fertilizer is already being made from molasses. The fertilizer most used is  $(\text{NH}_4)_2\text{SO}_4$ , partly of domestic manuf., but mostly imported from England. The fixation of atm. N can probably be developed on a com. scale. Competition from Chile or Norway is not much feared.

JULIAN F. SMITH.

**Fertilizer from the effluent from potassium chloride works.** W. HÜTTNER. *Chem. Ztg.* 42, 434-5(1918); *J. Soc. Chem. Ind.* 37, 666A.—The effluent is introduced into a tank contg. quicklime, the latter being covered with the liquid; heat is developed and the whole is converted into a powdery mass which consists of  $\text{MgO}$ ,  $\text{Mg}$  and  $\text{Ca}$  oxychlorides, small quantities of  $\text{KCl}$ ,  $\text{NaCl}$ ,  $\text{CaSO}_4$ , etc. Its fertilizing value depends chiefly on the presence of the  $\text{Mg}$  oxide.

E. J. C.

**Flue dust.** J. A. VOELCKER. London. *Roy. Agr. Soc. England, Occasional Notes*, No. 3, 4-5(1918).—Attention is called to the variable  $\text{K}_2\text{O}$  content of flue dust, and it is recommended to purchasers that guarantees be demanded not merely as to the total amt. of  $\text{K}_2\text{O}$  in the material, but also as to the amt. that is sol. in water. An analysis of a typical flue dust showed 5.99% of total  $\text{K}_2\text{O}$ , and 2.65% sol. in water.

W. H. ROSS.

**Utilization of nitrogenous refuse (leather and horn waste, etc.).** E. DONATH AND G. ULRICH. *Chem. Ztg.* 20, 165-8(1917); *Z. angew. Chem.* 31, II, 218(1918); *J. Soc. Chem. Ind.* 37, 598A.—Refuse, rich in nitrogenous matter, is heated with waste  $\text{H}_2\text{SO}_4$ ; a portion of the N is thus converted into  $(\text{NH}_4)_2\text{SO}_4$  and the remainder is obtained in the form of a highly nitrogenous charcoal. Products which are practically dry, and rich in  $(\text{NH}_4)_2\text{SO}_4$ , are obtained by heating for several hrs. at over  $240^\circ$ . Chamber acid or waste  $\text{H}_2\text{SO}_4$  may be used. If larger proportions of acid are employed, pasty products are obtained from which fertilizer mixts. may be prepd. by combining them with ground limestone or phosphate. The yield of  $(\text{NH}_4)_2\text{SO}_4$  can be increased by carrying out the destruction in the presence of certain catalytic agents, preferably at  $250-70^\circ$ .

E. J. C.

**Potassium ammonium nitrate, a new top-dressing for sugar-beet.** M. HOFFMANN. *Deut. Zuckerind.* 43, 149-50(1918); *Z. angew. Chem.* 31, II, 313; *J. Soc. Chem. Ind.* 37, 744A.— $\text{K NH}_4$  nitrate prepd. from  $\text{NH}_4\text{NO}_3$  and  $\text{KCl}$  has been used in some places for small expts. It is easy to distribute over the land, and contains about 13% N, 25%  $\text{K}_2\text{O}$ , 3-4%  $\text{H}_2\text{O}$ , and 27-30% Cl. This material can be used with perfect safety as a top-dressing. It has the advantage over  $\text{NH}_4\text{NO}_3$ , that it can be spread more uniformly and is much less hygroscopic and explosive. According to Schneidewind,  $\text{K NH}_4$  nitrate has exactly the same action as an equiv. amt. of  $\text{NaNO}_3$ . It is proposed to put a  $\text{Na NH}_4$  nitrate on the market.  $\text{NH}_4\text{Cl}$  contg. 23-25% N has been put on the market this year, and has the same effect as the sulfate, but care must be taken in using it for plants sensitive to Cl.

E. J. C.

**By-product lime (Endlaugenkalk).** B. KOSMANN. *Tonind. Ztg.* 42, 579-80(1918); *J. Soc. Chem. Ind.* 37, 744-5A.—A very brief summary of the various processes patented for prepg. a lime fertilizer from the waste liquors obtained in the extn. of K from the Stassfurt salts. Essentially they consist in treating the liquor with an excess of  $\text{Ca}$  oxide.  $\text{Mg}(\text{OH})_2$  and  $\text{CaCl}_2$  are formed, and these, together with excess of lime, form the principal constituents of the product. An analysis of one sample is given, which contd. 9% of  $\text{Mg}(\text{OH})_2$ , 50% of  $\text{Ca}(\text{OH})_2$ , and 34.26% of calcium chloride ( $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ ).

E. J. C.

**Analyses of county limestone deposits.** J. W. AMES. *Mo. Bull. Ohio Agr. Exp. Sta.* 3, 222-3(1918).—Analyses of 254 samples from various parts of the state are given. Results are expressed in terms of percentage of  $\text{CaCO}_3$  equiv. to the neutralizing power of the Ca and Mg content. A. suggests that many of these deposits not developed commercially might serve as local sources of ground limestone for agricultural uses.

T. G. PHILLIPS.

**New experiments in potassium fertilization.** H. G. SÖDERBAUM. *Kgl. Landtbruks-Akad. Handl. Tid.* 57, 501(1918).—*Experiments with marine salts:* These salts are made to simulate such as may be obtained through the evapn. of sea water. They are characterized by a low content of KCl and a high content of NaCl and  $\text{CaCl}_2$ . The results showed that the presence of Cl up to a certain amt. was of benefit to the formation of seed, oats being the cereal tried. Beyond a certain amt. the Cl was very harmful. The most significant result was that a large amt. of Cl can be tolerated in the presence of a sufficient amt. of lime, showing that these marine salts can be used on soils rich in lime or on soils to which large amts. of lime have been added. *Experiments with potash-lime:* This is manufd. by mixing one part of feldspar of high potassium content, one part limestone and one part gypsum, all ground fine, briqueted and burned at  $1180^\circ$ . Application of this material gave larger crop increases than the check pots in which a mixt. of 80% KCl, 10% NaCl, and 10%  $\text{CaCl}_2$  was used for comparison. That this soil was in need of lime was shown by the good results obtained from the application of  $\text{CaCO}_3$  from marble. The good results obtained from the use of potash-lime can in a measure be ascribed to the benefit from the extra addition of lime.

C. O. SWANSON.

**The effect of manganese on the growth of wheat; a source of manganese for agricultural purposes.** J. S. MCHARGUE. *J. Ind. Eng. Chem.* 11, 332-5(1919).—Wheat plants grown in both pot and water cultures with and without Mn were found to exhibit in the absence of Mn a lack of chlorophyll development and a tendency to droop, which was not observed at any time in the case of plants receiving Mn. The use of the Mn in suitable diln. was observed to stimulate the growth of the wheat and to increase the size and N content of the grain, and thus evidently performs an important function in the normal growth and development of the plant. Basic slag contains about 100 lbs. of Mn to the ton, and it is thought possible that some of the benefit to crops resulting from the use of this fertilizer on certain soils may be due to this element. A convenient support is suggested for growing plants in water cultures.

W. H. ROSS.

**Continuation of field trials with newer nitrogenous fertilizers.** SIGURO RHODIN. *Kgl. Landtbruks-Akad. Handl. Tid.* 57, 443(1918); cf. *C. A.* 7, 1573; 8, 195.—While  $\text{CaCN}_2$  is the cheapest of the newer nitrogenous fertilizers, the fine powdered form is objectionable because of the difficulties in handling. Before it can be utilized by plants it must undergo chemical change, and to bring this about rapidly, catalyzers are needed. The soil furnishes these and also carbonaceous matter. To test the advantage of adding these catalyzers to the  $\text{CaCN}_2$  before it was applied to the soil was the object of these expts. The catalyzers added were calcd. also to improve the physical condition of the  $\text{CaCN}_2$ . A number of substances were used, mostly by-products from iron and stone works, carrying Fe, Mn or Al. In addition to these NaCl and powdered charcoal were used. The field trials were so contradictory with respect to most substances that no definite conclusions could be drawn except with powdered charcoal. The pronounced results obtained from this substance are thought to be due to the great adsorptive power of charcoal. Ordinary Norwegian saltpeter, basic Norwegian saltpeter,  $\text{CaCN}_2$ ,  $(\text{NH}_4)_2\text{SO}_4$  from German coke ovens,  $(\text{NH}_4)_2\text{SO}_4$  from Swedish gas works,  $\text{NH}_4\text{NO}_3$  from the Norwegian Hydro-electric Nitrogen Stock Co., were used in field trials with

ordinary Chili saltpeter as a standard for comparison. The largest increase was obtained with  $\text{NH}_4\text{NO}_3$ , followed by the different kinds of saltpeter, all of which produced essentially equal results. The  $(\text{NH}_4)_2\text{SO}_4$  was third in value while the smallest increases in the crop were obtained from the use of  $\text{CaCN}_2$ . C. O. SWANSON.

**Farmer's experiment plots.** Southern district. H. C. STENING. *Agr. Gas. N. S. Wales* 29, Pt. 10, 717-23(1918).—Summer fodder expts. (1917-18) were conducted with 5 varieties of maize, 3 saccharine sorghums, 4 non-saccharine sorghums, and a variety each of black cowpeas, Japanese millet and Sudan grass. The original article should be consulted for details of the results of the variety tests. Fertilizer tests with Funk's Yellow Dent were also conducted. R. B. DEEMER.

**Effect of carbon disulfide and toluene upon nitrogen-fixing and nitrifying organisms.** P. L. GAINNEY. *Kans. Agr. Expt. Sta. J. Agr. Research* 15, 601-15(1918); cf. *C. A. S.* 8, 1634.—Using the methods employed in previous work, soils rich in nitrifying organisms were treated with varying amts. of toluene or  $\text{CS}_2$ , the moisture content of the soils being varied, and the soils were incubated for 6 months, and at intervals analyses were made for *Azotobacter*, nitrates and  $\text{NH}_3$ . Both toluene and  $\text{CS}_2$  when applied in sufficient quantities destroyed *Azotobacter* and checked nitrification, the quantities needed to do this increasing with rise in moisture content up to about 10% of  $\text{H}_2\text{O}$ , greater moisture content having little effect. The *Azotobacter*, if affected at all, was usually killed, and at this point the rate of nitrification was  $\frac{1}{4}$  to  $\frac{1}{2}$  as great as normal, showing that other organisms than *Azotobacter* cause nitrification, and to destroy these latter organisms much more of each chemical was required, and even 10 cc. of toluene per 50 g. of soil failed to destroy all nitrification. An accumulation of  $\text{NH}_3$  occurred only where nitrification was checked. R. N. HARGER.

**Lime-sulfurs.** VERMOREL AND DANTONY. *Compt. rend. acad. agr.* 5, 161-4 (1919).— $\text{CaS}_2\text{O}_3$ ,  $\text{CaS}_4$ ,  $\text{CaS}_5$  and oxysulfides of Ca are contained in the soln., while S, CaO,  $\text{CaSO}_3$ ,  $\text{CaSO}_4$  and oxysulfide of Ca occur in the sediment. At ordinary temp. oxysulfides of Ca and  $\text{CaS}_2\text{O}_3$  and a little  $\text{CaS}_4$  are formed after contact of several months. The quantity of sol. salts formed increases with increase of temp. up to  $100^\circ$ .  $\text{CaS}_2\text{O}_3$  is chiefly formed at low temps. and sulfides predominate at elevated temps. though the absolute quantity of thiosulfate increases. The content of dissolved S increases with time of boiling up to 45 min. and then decreases. Tetrasulfide is first formed and then pentasulfide progressively appears. The max. S in soln. is obtained with a proportion of 3.2 of S to 1 of Ca. Below 2.9 of S to 1 of Ca pentasulfides are obtained, above this a mixt. of tetra- and pentasulfides. The quantities of S and CaO that dissolve increase with increase of  $\text{H}_2\text{O}$  up to 3.1 of  $\text{H}_2\text{O}$  to 1 of the sulfur and lime mixt. The slower the cooling the less the proportion of  $\text{CaS}_2\text{O}_3$ . The greater the surface exposed to air the more the  $\text{CaS}_2\text{O}_3$  formed. MgO caused a loss of S by disengagement of  $\text{H}_2\text{S}$ . The presence of an excess of CaO in the sediment tends to the formation of oxysulfides of Ca. The d. of the soln. does not regularly accord with the content of S and consequently it is no criterion on which to base an estimate of the S in soln. ALBERT R. MERZ.

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**Potash salts in Hungary (KONEK-NORWALL) 18.** Bolly refuse (DOWELL, FRIEDEMANN) 12.

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**Fertilizer.** A. FOSS. U. S. 1,292,293, Jan. 21. A fertilizer is prepd. by adding sufficient  $\text{HNO}_3$  to raw phosphates associated with  $\text{CaCO}_3$  to render them sol., stirring the mass while it is in a semi-liquid state and simultaneously passing a current of air through it. Cf. *C. A.* 12, 1811.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Food value of the ciders sold in open market. A. GUILLAUME AND H. CHLO. *Bull. sci. pharmacol.* 25, 334-42(1918).—Samples of ciders purchased by French troops during 1917 and 1918 gave the following minimum and maximum figures on analysis: Total alc., 0.0-0.94°; dry matter, 1.40-13.70%; reducing substances, 0.65-7.85%; total acidity, 1.52-3.53%; ash, 0.30-1.50%. The ciders made by the soldiers had a greater food value as evidenced by the following: Total alc., 1.20-4.02°; dry matter, 6.10-46.60%; reducing substances, 0.90-31.66%; total acidity, 1.91-2.80%; ash, 0.30-3.70%. A brief description of the process of manuf. is given.

F. S. HAMMETT.

Utilization of residues from Brunswick beer (wort). O. REINKE. *Chem. Ztg.* 42, 367(1918); *J. Soc. Chem. Ind.* 37, 557A.—In the manuf. of strong Brunswick beer, the wort is evapd. until it contains 60% of ext., and then filtered. The residue thus sepd. still contains about 54% of sol. matter which may be extd. and used over again, while the insol. portion, when dried and roasted, forms a coffee substitute. E. J. C.

Decarbonation of water used for diluting war beers. H. KRUMHAAR. *Woch. Brau.* 35, 121(1918); *J. Soc. Chem. Ind.* 37, 779A.—K. discusses the possible effects of carbonates present in waters used for dilg. beers. The formation of ppts. by interaction with the salts in the beer is not to be feared, since the concn. of the reacting substances is very low and the temp. also is low. Carbonates will, however, reduce the acidity of the beer by partially neutralizing free lactic acid. In some cases, e. g., lager beer, this is not of great importance; but where the character of a war beer depends on the presence of free acid, dilg. water rich in carbonates should be decarbonated.

E. H.

Influence of stimulants and of storage under water and beer, on the maltase-activity of yeast. F. SCHÖNFELD AND M. KORN. *Woch. Brau.* 35, 129-32(1918); *J. Soc. Chem. Ind.* 37, 779A.—Treatment of bottom-fermentation beer yeast with 4% solns. of  $K_2PO_4$  for several hrs., was found to stimulate the activity not only of the ymase but also of the maltase (see *C. A.* 12, 972, 973). The maltase activity was also increased by treatment with 0.6% solns. of lactic, phosphoric and tartaric acids, especially by the first named. Yeast stored under water suffered a very slow reduction of maltase-activity, amtg. to about 25% in 8 days. Storage under beer produced a more rapid change in the same direction. In general, conditions which affect the ymase of living yeast appear to exert a similar effect on the maltase.

E. H.

Iron-sickness in thin beers. W. WINDISCH. *Woch. Brau.* 35, 69-70, 95-6, 109-10(1918); *J. Soc. Chem. Ind.* 37, 779A.—In Germany war beers of very low gravity have proved subject to a malady resembling the iron-sickness of wines, which is due to the formation of ferric tannate. The beers affected become greenish and eventually blackish in color, and acquire an inky flavor. It is suggested that the Fe is probably dissolved by the wort after fermentation owing to contact with naked metal, or is introduced into the beer in the water used in some cases for diln. Decarbonation by boiling appears to render some waters more "aggressive" towards Fe, so that contact of such waters with the metal, during cooling or afterwards, becomes a source of danger. Cf. following abstract.

E. H.

Maladies of thin beers. W. WINDISCH. *Woch. Brau.* 35, 153-6(1918); *J. Soc. Chem. Ind.* 37, 779A.—The war beers of low gravity produced in Germany have been remarkably free from maladies due to microorganisms. The chief troubles have arisen from tannin-protein turbidity and Fe-sickness (cf. preceding abstr.), in both of which tannin plays an essential part. Some amelioration might be effected by reducing the

tannin content of the beer, *e. g.*, by using a smaller proportion of hops or extg. them with cold water before use, or by promoting the soln. of proteins during mashing with a view to the subsequent pptn. of tannins. The fact that the maladies are almost confined to beers of 3% gravity or under, probably indicates that these beers are deficient in some protective constituent, which W. conceives to be free acid. He therefore advocates higher acidities in thin beers, and in this connection recommends treatment with lime as the most economical and effective means of decarbonating brewing waters.

E. J. C.

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Industrial alcohol from molasses (FOSTER) 28.

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## 17. PHARMACEUTICAL CHEMISTRY.

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W. O. EMERY.

A review of the advances in pharmacy. J. K. THUM. *Am. J. Pharm.* 91, 157-63 (1919); cf. C. A. 12, 2406.

W. G. GAESSLER.

Examination of a sample of gum asafetida. EDO CLAASSEN. *Am. J. Pharm.* 91, 164 (1919).—C. found adulterations representing nearly half the quantity of the gum as follows: gum 54.45%, calcite 35.51%, and granite 10.04%. W. G. GAESSLER.

Sulfuric acid test for strophanthus seeds. P. BOHRISCH. *Pharm. Zig.* 63, 318-9 (1918); *J. Soc. Chem. Ind.* 27, 559A.—The H<sub>2</sub>SO<sub>4</sub> test for strophanthin, by which a green coloration is obtained immediately with the official (Kombé) variety of seed, has not been very accurately specified. Especially when the word "cross-section" is interpreted to mean the surface of a seed which has been cut in half, the indications of the test are variable and indefinite. B. had investigated the various modifications of the test which have been proposed, and recommends the following procedure: Thin cross-sections of the seeds are placed on an object glass and treated with a little Et<sub>2</sub>O to remove the fat; they are then covered with 1 drop of H<sub>2</sub>SO<sub>4</sub> which has been dild. with 1/4 of its wt. with H<sub>2</sub>O. The endosperm and at least the outer portions of the embryo leaves show a deep green coloration, which is best observed under a low-power microscope or a strong magnifying glass.

W. O. E.

Keeping qualities of trypaflavin solutions. A. ABELMANN. *Pharm. Zig.* 63, 270 (1918); *J. Soc. Chem. Ind.* 37, 559A.—The yellow dyestuff trypaflavin (diaminomethylacridinium chloride) is employed therapeutically in the form of a 0.1% soln. as a bactericide which is comparatively non-toxic to animal tissues and preserves its activity in presence of serum. The 1% soln. is extremely sensitive to strong sunlight; it turns brown after exposure for 1 day, the brown color slowly increasing on further exposure to light. A soln. exposed to light and left open to the air for a month became dark brown and developed a growth of *Actinomyces*, in spite of undecomposed trypaflavin still present. With the addition of Na<sub>2</sub>CO<sub>3</sub>, sulfite, or chloride, decomposition takes place with the formation of a brown ppt., but the liquid remains bright yellow on exposure to light. Trypaflavin solns. keep perfectly well in the dark, and decompose only slowly in diffused daylight; 1% solns. are considerably more stable than 0.1% solns. Addition of AcOH or citric acid, or of H<sub>2</sub>O<sub>2</sub>, produces the brown color even in the dark, and must therefore be avoided. Adequate protection from light by the use of dark colored bottles and preservation in the form of more concd. solns. are recommended.

W. O. E.

Scammony and its substitutes. W. L. SCOVILLE. *J. Ind. Eng. Chem.* 11, 335-6 (1919).—A recently examd. sample of *Tesina drastica* revealed general characteristics resembling both true and Mexican scammony resins. It is slightly more acid and

strongly levorotatory ( $-32.4$ ); acid no., 28; sapon no., 136; color with  $\text{FeCl}_3$ , dark green. Its color alone would distinguish it, and treatment with decolorizing charcoal does not take out the color appreciably. Freshly pptd. it has an agreeable tea-like odor which disappears on drying. Probably a small amt. of volatile oil is present in the drug. The powdered resin resembles scammony resin in odor. W. O. E.

**Adulteration of neosalvarsan.** L. P. J. PALET. *Ann. fals.* 11, 299-300(1918).—A sample purporting to be "Novarsenobenzol Billon" was found to consist of some phenolic substance, sulfates and other salts of Na, together with coloring matter. Injection in a rabbit failed to produce any reaction worthy of mention. A test for As was negative. In this connection are mentioned numerous cases of substitution or sophistication of salvarsan and neosalvarsan, in Argentine and other countries of S. America, with NaCl and corn starch colored with picric acid. W. O. E.

**Detection of hydrochloric acid in chloroform.** *Ber. pharm. Ges.* 28, 385-8(1918); *J. Soc. Chem. Ind.* 38, 55A.—Ten cc. of  $\text{CHCl}_3$  are treated with a minute particle (about 0.01 mg.) of *p*-dimethylaminoazobenzene; if free HCl is present a violet-red coloration results; otherwise the soln. remains yellow. An excess of the indicator must be avoided, since the yellow color may mask a feeble coloration given by a mere trace of the acid. In doubtful cases, it is advisable to treat a further quantity of the  $\text{CHCl}_3$  with a few drops of the first portion containing the indicator. This method is more sensitive and reliable than the usual way of testing  $\text{CHCl}_3$  by shaking with  $\text{H}_2\text{O}$  and then testing with litmus, as there is risk of gradual decompn. of the  $\text{CHCl}_3$  in the presence of  $\text{H}_2\text{O}$ .  $\text{CO}_2$  and anhydrous  $\text{CO}_2\text{H}_2$  and  $\text{AcOH}$  do not give a red coloration with *p*-dimethylaminoazobenzene in  $\text{CHCl}_3$  soln. W. O. E.

**Digitalis substances.** XXXVIII. H. KILIANI. *Ber.* 51, 1613-39(1918); *J. Soc. Chem. Ind.* 38, 54A.—A record of some neutral and acid substances obtained by the oxidation or reduction of digitogenic acid, gitogenic acid, digitoxigenin, and digitaligenin. The sugar sirup previously obtained (cf. *C. A.* 10, 2720) could not be made to crystallize because the sugars in the sirup, which had been prepd. in an alc. medium, were present chiefly in the form of Et glucosides. After a 2nd hydrolysis with HCl, a partial crystn. was effected and *d*-galactose obtained by inoculation; dextrose, identified as *d*-gluconic acid, and apparently a 3rd sugar, a ketose, were also present. W. O. E.

**Detection of quinine.** H. SALOMON. *Ber. pharm. Ges.* 28, 273-5(1918); *J. Soc. Chem. Ind.* 38, 54A.—The fluorescence produced when a quinine soln. is treated with dil.  $\text{H}_2\text{SO}_4$  is a very sensitive test and will detect 1 pt. of the alkaloid in 100,000 pts. of soln. A less sensitive test (1 in 10,000) consists in treating the quinine with Cl and then with  $\text{NH}_3$ , a green coloration being produced (thalleioquin reaction). It is recommended that Br be used in place of Cl in this test; the Br water must be added cautiously until the soln. is just colored yellow and a drop of  $\text{NH}_3$  then introduced. Another reagent for quinine recommended by Giemsa and Halberkann (*Deut. med. Wochschr.* 1917, No. 48) consists of KI 10,  $\text{HgCl}_2$  2.7,  $\text{H}_2\text{O}$  200, and  $\text{AcOH}$  2.5 g. This gives a turbidity with a soln. containing 1 pt. of quinine in 200,000 pts. To detect quinine in urine, the alkaloid should first be extd. with  $\text{Et}_2\text{O}$ . W. O. E.

**Constitution of substances from gualiacum resin.** G. SCHROETER, L. LICHTENSTADT AND D. IRINEU. *Ber.* 51, 1587-1613(1918); *J. Soc. Chem. Ind.* 38, 55A.—Among the products obtained by the dry distn. of guaiacum resin are 2 substances of unknown constitution, pyroguaiacin and guaiene. The latter is now shown to be 2,3-dimethylnaphthalene by its synthesis. Pyroguaiacin is almost certainly 6-hydroxy-7-methoxy-2,3-dimethylnaphthalene. Guaiaretic acid, extd. from guaiacum resin by  $\text{Et}_2\text{O}$ , has the formula  $\text{C}_{20}\text{H}_{24}\text{O}_4$ , not  $\text{C}_{20}\text{H}_{26}\text{O}_4$  as stated by Herzig and Schiff (*Monats.* 18, 714-21 (1897); 19, 95-105(1898)). It is optically active,  $[\alpha]_D = -94^\circ$  in alc., and unsatd.

Herzig and Schiff's norguaiaretic acid is shown to be norhydroguaiaretic acid. Hydroguaiaretic acid methyl ether is most probably  $\alpha,\delta$ -diveratryl- $\beta$ -dimethylbutane, and guaiaretic acid methyl ether has the formula  $C_6H_5(OMe)_2.CH:CHMe.CHMeCH_2C_6H_5(OMe)_2$ . The synthesis of 1,2-dimethylnaphthalene,  $b.p.$  139-40°, is described.

W. O. E.

The history of compressed drugs. The dry salves of the Roman oculists. M. BOUVET. *Bull. sci. pharmacol.* 26, 28-32(1919).—A brief historical résumé of the development of the prepn. of drugs in tablet form.

F. S. HAMMETT.

A study of new methods of extraction and analysis of alkaloids. L. R. DE ROSEMONT. *Bull. sci. pharmacol.* 26, 23-8(1919).—On the basis that the use of dil. mineral acids in the extn. of alkaloids causes variability in the product, R. advocates the use of dil. org. acids in their place and gives detailed directions for methods of procedure when 2.5% acetic, oxalic, tartaric, citric, and  $\beta$ -naphthalenesulfonic acids are used. A table of results is appended giving the % yield of alkaloids from various sources when the above solvents are used.

F. S. HAMMETT.

*Cinchona robusta*. A. GROOTHOFF. *Ind. Merc.* 40, 1025-7(1917); *Chem. Weekblad* 16, 82(1919).—A review of G.'s own investigations and of the work of others on the growth and analysis of the bark of *Cinchona robusta*.

JULIAN F. SMITH.

Recovery of silver from albumose-silver solutions. Methods for the analysis of these solutions. G. MAURE. *Chem. Ztg.* 42, 513-5(1918); *J. Soc. Chem. Ind.* 37, 782-3A.—Large quantities of 0.1% albumose-Ag solns. are now used in certain hospitals and the recovery of the Ag from the used soln. is of importance. The following method is recommended for the purpose: Treat 360 l. of the waste soln. with 60 g. of  $H_2SO_4$  mixed with 200 cc. of water, and add 19 g. of NaCl dissolved in 200 cc. of water; allow the ppt. to settle, collect on a filter, dry, and fuse with a mixt. of  $K_2CO_3$  30,  $Na_2CO_3$  30, and  $KNO_3$  15 g. Pour the mixt. while still fluid into cold water and collect the metallic Ag. The cost of treating 360 l. of the soln. is estd. to be M. 0.12; the wt. of Ag recovered is 33.6 g., having a value of M. 13.75. An alternative method consists in pptg. the Ag with  $NH_4SCN$  in the presence of  $H_2SO_4$ ; the  $AgSCN$  is then treated as described. The estd. cost in this case is M. 0.23. To det. Ag in albumose-Ag soln., the Ag is first pptd. as metallic Ag (by reduction) or as some insol. salt which is fused with alkali carbonate and nitrate, and the Ag is then dissolved in  $HNO_3$  and titrated. Methods using the following reagents yield accurate results: Lactose and NaOH, tannin, HCl, KBr and  $H_2SO_4$ , KI and  $H_2SO_4$ ,  $NH_4SCN$  and  $HNO_3$ ,  $K_4Fe(CN)_6$  and AcOH. Reduction with  $FeSO_4$  or oxidation of the org. matter with permanganate, gives low results.

E. H.

The distribution and characters of some of the odorous principles of plants. FREDERICK B. POWER. *J. Ind. Eng. Chem.* 11, 344-52(1919).—An address. The chem. nature of essential oils, and the general methods for their extn. are discussed briefly. The more important oils are described and grouped according to the families of plants from which they are obtained.

T. G. PHILLIPS.

Note on opium analysis. D. B. DORT. *Pharm. J.* 101, 318(1918).—D. declares probably unwarranted the recommendation of Annett and Singh (*C. A.* 12, 2652) to remove codeine from the lime soln. by means of toluene previous to treatment with  $Et_2O$  and  $NH_4Cl$  (B. P.) so as to avoid the solvent effect of codeine on morphine. Using  $C_6H_6$  in place of toluene, he finds no gain of pure morphine when comparing results with a parallel detn. by the official process.

S. WALDBOTT.

Ghassoul, a Morocco drug. E. M. HOLMES. *Pharm. J.* 101, 317(1918); cf. *C. A.* 13, 770.—H. recalls the fact that in 1875 he identified this drug brought from Abyssinia by Dr. Leared, as a species of *Mesembryanthemum*.

S. WALDBOTT.

**Assay of tablets.** F. RICHARD. *J. pharm. chim.* 19, 5-17(1919).—Two tables summarize results of examn. of 12 com. samples, each of antipyrine and of aspirin tablets as to av. wt., no. per kg., % of the drug and g. per tablet; nature of excipient and of ash, also m. p. of the isolated drug. In 0.5 g. tablets, antipyrine varies from 0.450 to 0.560 g., aspirin from 0.44 to 0.582. French aspirins contain no trace of free salicylic acid. R. exts. aspirin with H<sub>2</sub>O-free Et<sub>2</sub>O; final drying at 100° should not go beyond 2 hrs. M. p., 130-134°; to obtain 135-6°, allow the crystals to "condense" for 3 or 4 days. Quinine tablets, containing 0.2 to 0.25 g. of the basic HCl-salt, are extd. with abs. EtOH or CHCl<sub>3</sub>. Dissolve the evapn. residue in 100 cc. H<sub>2</sub>O and polarize in a 20 cm. tube.  $[\alpha]_D^{20}$ —147.8° (Codex). It is generally between —148° and —155°, due to a small amt. of neutral HCl-salt,  $[\alpha]_D^{20}$ —219.5°. S. WALDBOTT.

**Note on podophyllin.** D. B. DORT. *Pharm. J.* 101, 318-9(1918).—D. recommends an NH<sub>3</sub> test to distinguish the resins of *Podophyllum peltatum* and *P. emodi*. The latter leaves a decidedly higher % of insol., gelatinized residue, upon treatment with dil. NH<sub>4</sub>OH. To 0.5 g. resin add 5 cc. dil. NH<sub>4</sub>OH and 5 cc. H<sub>2</sub>O, stir well, filter after 20 min., wash and dry near 100°. Not more than 0.13 g., i. e., 26% should be obtained, if the resin has been prepd. from the rhizome of *P. peltatum*. That of *P. emodi* would probably yield about 60% under the same conditions. S. WALDBOTT.

**Action of iodine on hypophosphorous and phosphorous acids.** Application to the determination of hypophosphites and phosphites. BOYER AND BAUZIL. *J. pharm. chim.* 18, 321-34(1918).—The detns. are based on the following reactions: (a)  $H_3PO_2 + 2I_2 + 2H_2O = H_3PO_4 + 4HI$ ; (b)  $H_3PO_3 + I_2 + H_2O = H_3PO_4 + 2HI$  (in acid medium only); (c)  $H_3PO_3 + I_2 + H_2O = H_3PO_4 + 2HI$  (in alk. medium only). In detg. hypophosphites, b + c are used. When phosphites are absent, reaction c consumes the same amt. of I as b. In b the speed of the reaction with AcOH is only 1/10 of that when HCl or H<sub>2</sub>SO<sub>4</sub> are employed. A graph shows the progress of I absorption in 1, 3, 7, 12 hrs. with different amts. of H<sub>2</sub>SO<sub>4</sub>. An increase will shorten the time. For reaction c, several graphs are given, showing the speed of oxidation in presence of NaOH, Na<sub>2</sub>CO<sub>3</sub> and NaHCO<sub>3</sub>, also the effect of equimol. amts. of each on the oxidation in 30 min. and in 3 hrs. Only about 33% as much I is absorbed when NaOH is used as when Na<sub>2</sub>CO<sub>3</sub> or NaHCO<sub>3</sub> is used, confirming Bougault (*C. A.* 11, 2643, 2756). The reaction is finished in 30 min. with NaHCO<sub>3</sub>, but not until after 3 hrs. with Na<sub>2</sub>CO<sub>3</sub>. With NaOH, secondary reactions predominate, e. g., formation of NaIO, or of H<sub>2</sub>SO<sub>4</sub> from Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. An excess of NaHCO<sub>3</sub> does no harm, but it is best to acidify before detg. the excess of I. To det. H<sub>3</sub>PO<sub>2</sub> in hypophosphites, dissolve 1 g. in boiled H<sub>2</sub>O, fill to 100 cc.; to 10 cc. thereof add 10 cc. of 25% H<sub>2</sub>SO<sub>4</sub>, then 30 cc. 0.1 N I. Keep the mixt. in the dark for at least 8-10 hrs., then titrate with Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> soln. To det. H<sub>3</sub>PO<sub>3</sub> in phosphites, dissolve 1 g. in 100 cc. of H<sub>2</sub>O. To 10 cc. thereof add 10 cc. of 5% NaHCO<sub>3</sub>, then 20 cc. 0.1 N I. After 2 hrs. add 10 cc. of 10% AcOH and titrate with thio soln. The phosphates formed or added may be detd. by Bauzil's method (*C. A.* 12, 919). For control, detn. of total P as H<sub>3</sub>PO<sub>4</sub> may be made. Analyt. results of the examn. of 11 com. samples of hypophosphites and 4 of phosphites are given. Three Na salts of the former showed 92.0, 90.1 and 99.7% NaPO<sub>2</sub>H<sub>2</sub>.H<sub>2</sub>O. S. WALDBOTT.

**Gravimetric determination of glycyrrhizin.** A. ASTRUC AND G. PICHARD. *J. pharm. chim.* 18, 289-90(1918); cf. *C. A.* 12, 1235.—Dissolve 3 g. of licorice ext. dried at 100° in 30 cc. H<sub>2</sub>O containing 5 drops of NH<sub>4</sub>OH and filter. To 20 cc. of filtrate add 2.5 cc. H<sub>2</sub>SO<sub>4</sub> and allow to stand for 24 hrs. Decant the limpid liquid upon a filter, wash the residue with a total of 30 cc. H<sub>2</sub>O, filter and reject the washings. Dissolve the residue with 1 or 2 cc. NH<sub>4</sub>OH soln., pass the soln. through the filter and wash with 10 cc. H<sub>2</sub>O containing 5 drops of NH<sub>4</sub>OH, until the washings are colorless.



Evap. the soln. on a water bath and dry at 100°. Add 0.04 g. per 40 cc. of washings and calc. %.

S. WALDBOTT.

**Alcohol-free head and mouth washes.** P. FLEISSIG. Basel. *Schweiz. Apoth. Ztg.* 56, 681-2(1918).—F. gives the following substitute for "Eau de Botot," used as a mouth wash at the Basel hospital: Al acetate tartrate soln. 100.0, H<sub>2</sub>O 1000.0, tincture of cochineal 20.0, menthol 1.0, dissolved in concd. EtOH 3.0; ol. menthae 2.0; 10 saccharin tablets. Other formulas are quoted.

S. WALDBOTT.

**Examination of a Transvaal croton bark.** HENRY G. GREENISH. *Pharm. J.* 101, 289(1918).—The bark is used by the natives near Delagoa Bay as a remedy for bilious malarial fever. (J. Maberley, 1899.) At Kew Gardens it was identified as *Croton Gubouga* S. Moore. The characteristic taste of the bark is due to an acrid principle causing persistent numbness upon tasting, and redness and irritation when a 50% alc. tincture is applied to the skin. It is very sol. in petroleum spirit, which removed from the bark 2.54% of an acrid fat; Et<sub>2</sub>O then extd. 0.49%, less acrid; CHCl<sub>3</sub> then removed 0.53%, non-acrid. 97% EtOH then extd. 2.71% of acrid substance. No alkaloid was present. The acrid principle, a brownish yellow, viscous oil, is not volatile with steam.

S. WALDBOTT.

**Action of eusol upon certain ligatures and sutures.** D. G. SHELDON. *Pharm. J.* 101, 150(1918).—Samples of linen thread, silk, silkworm gut, catgut (4 kinds), horse hair, silver wire and Kangaroo tendon were partly immersed in freshly prepd. eusol each in a corked tube, and observed for 8 days. S. concludes that eusol, owing to its solvent or destructive action, is unsuitable for continuous use in the presence of all the threads mentioned except linen thread and Ag wire.

S. WALDBOTT.

FUMOZUE, V.: *Commentaire pratique pour les fabricants de spécialités pharmaceutiques concernant la réglementation des substances vénéneuses.* Paris: V. Fumouze, 78 Faubourg Saint-Denis. For review see *Bull. sci. pharmacol.* 25, 374 (1918).

GATTEFOSSÉ, R. M.: *Agenda du chimiste-parfumeur, suivi de la teinture descheveux*, by A. Chapelet. Paris: 25 Rue Lauriston. 312 pp. For review see *Bull. sci. pharmacol.* 26, 92(1919).

GHOSH, J. C.: *Indigenous Drugs of India. Their Scientific Cultivation and Manufacture with Suggestions for the Development of New Industries.* Calcutta: Butterworth & Co., Ltd. 32 pp. 12 Annas (1 s.)

ROLET, ANTONIN: *Plantes à parfums et plantes aromatiques.* Paris: J. B. Baillière et Fils, 432 pp.

Gehe's Codex der Bezeichnungen von Arzneimitteln, kosmetischen Präparaten und wichtigen technischen Produkten. 2nd Ed. 638 pp. geb. M 8.50. Nachtrag zu Gehe's Codex. 115 pp. M 3. Samen geb. M 11.55. For review see *Pharm. Weekblad* 56, 161(1919).

Determination of free and carbonated alkalies in alkaline solutions of hypochlorites (PHILIBERT) 7. Synthetic camphor (DUBOSC) 10.

**Active substance from ergot.** A. GAMS. U. S. 1,292,394, Jan. 21. Ergot 1200 g. is finely ground and freed from oil by extn. with petroleum ether. The dried powder is then successively extd. with H<sub>2</sub>O (2 portions of 5 l. each), 2 portions of alc. containing a small amt. of formic acid and with 4 l. alc. (80%) containing 1 cc. concd. formic acid per l. The alc. ext. is freed from alc. and from formic acid by distn. and addition of H<sub>2</sub>O during the distn. and the aq. soln. remaining on evapn. is mixed with charcoal

and filtered, evapd. to a small volume, mixed with alc., filtered and evapd. to dryness. About 250 g. of a yellow-brown hygroscopic powder is obtained which is sol. in  $H_2O$  and has the full action of ergot.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Report of committee on chemical engineering education. Buffalo meeting. JAMES R. WITHROW AND A. D. LITTLE. *Trans. Am. Inst. Chem. Eng.* 10, 13-30.—Progress of Mann investigation is reported. Coöperation is urged with military by educational institutions in assistance to government at war. J. R. W.

Report of committee on chemical engineering education. St. Louis meeting. JAMES R. WITHROW. *Trans. Am. Inst. Chem. Eng.* 10, 30-1. J. R. W.

Key industries and Imperial resources. EDWARD J. DUVERN. *J. Roy. Soc. Arts* 67, 238-49(1919). E. H.

Continuous sulfuric acid sampler. S. A. IONIDES. *Chem. Met. Eng.* 20, 38-9 (1919); illus.—At the British Acetones plant in Toronto two 30-ton Chemical Construction Co. Gilchrist towers were installed to reconcentrate the  $H_2SO_4$  diluted in the regular operation. The coolers for the concd. acid were located below the main operating floor. The method of taking Baumé readings each hr. by dipping samples from the discharge pipe of the cooler and taking hydrometer readings from the dipper had its disadvantages in that acid was splashed on the operator's clothes, breakage of hydrometers was high, and carelessness in taking readings often enough was induced. A simple continuous sampling device consisting essentially of a miniature air-lift with  $1/8$  in. lead pipe was installed. The pipe extended from the discharge pipe of the cooler to 4 ft. above the floor to a sepg. head, from whence the liquid passed down into and through the sampling cup and the foam out through the air outlet pipe to the sampling tray and thence to the storage tanks. To prevent froth forming on the surface of the sampling cup, a trap was inserted between the sepg. head and the sampling cup. The air pipe with a nozzle of  $1/8$  in. was connected to the air supply used for agitating the acid in the concentrators and only a minute flow of air was required to give a steady flow of acid up the lift and through the sampling cup. The important points in the construction were: (1) the relative diams. of the air nozzle and the riser pipe, 1:3; (2) the position of the discharge pipe as near to the top of the sampling cup as possible for easy reading of the hydrometer; (3) the provision of some point at which the flow through the sampler could be observed to insure that a steady flow was passing. The advantages were: (1) the availability to observe the Baumé of the discharged acid at any time; (2) the elimination of acid splashing; (3) the marked reduction in hydrometer breakage. J. L. WILEY.

Manufacture of sulfuric acid by the chamber process. GEO. CHRISP. *Gas J.* 145, 173-5(1919); *Gas World* 70 (Coking and By-Products Section), No. 1802, 13-6 (1919)—“Although  $H_2SO_4$  is not at present regarded as a by-product of the coking industry, the probabilities are that in the future it will be recognized as such, by reason of developments in processes for the recovery of the S compds. in our coal.” The manuf. of acid by the chamber process is described. J. L. WILEY.

Application of electric heating to the concentration of sulfuric acid. S. PAGLIANI. *Ann. chim. applicata* 10, 134-7(1918).—Two general industrial methods of concg.  $H_2SO_4$  are in use: (1) The use of Pb basins and porcelain or quartz dishes with evapn. by the heat of the acid; (2) direct heating of the acid by a current of gas. Method (1) requires a minimum consumption of 18 kg. of coal to obtain 100 kg. of 65.6° Bé acid.

from the corresponding quantity of 50-52° Bé. On the average the consumption is 20%. App. based on method (2) requires only 10%. Systems of Pt vessels (Desmoutis system) require 12-15%. P. in his expts. upon elec. concn. of  $H_2SO_4$  used a tri-phase current and employed 3 electrodes of Pt plates in rectangular sandstone vessels containing 40-50 kg. acid. He found that 43 kw. were required to obtain a cwt. of 65.6° Bé. acid from 52° Bé. acid. The production was increased when closed vessels were used. He recommends quartz vessels, and better yet, enameled Fe vessels. He obtained a yield of 26.6 kg. 65.6° Bé. acid from 38 kg. 52° Bé. in 42 min., or at the rate of 40 kg. per hr. He calcs. that with elec. concn. of  $H_2SO_4$ , 430 kw. produce the same thermal effect as 100 kg. of coke or 180 kg. coal, in fire-concg. app. and concludes that working with elec. heating is better and more convenient than with fire heating, giving a product freer of impurities and in less time. ROBERT S. POSMONTIER.

**Potash in 1917.** HOYT S. GALE AND W. B. HICKS. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part II, 397-481 (Preprint No. 26, published Mar. 13, 1919). E. H.

**Formation of ammonia by heating coke with calcium hydroxide.** R. GLASER. *Feuerungstechnik* 6, 3-8(1917); *Z. angew. Chem.* 31, II, 248(1918); *J. Soc. Chem. Ind.* 37, 621A.—On heating coke with a large excess of  $Ca(OH)_2$  the C completely disappears and a large quantity of H is produced. The yield of  $NH_3$  increases with the temp., amtg. at 1145° to 40% of the total obtainable from the N contd. in the coke. On addition of Ni the yield of H is increased and the yield of  $NH_3$  reaches a max. at 630°, catalytic action of the Ni causing decompn. of the  $NH_3$  at higher temps. At 630°  $CH_4$  is also formed if Ni is present. E. J. C.

**Separation of potassium sulfate from the potash liquors of carbon dioxide factories and process for preventing the formation of this salt.** E. LUHMANN. *Z. ges. Kohlen-säureind.* 23, 471-2, 483-6(1917); *Z. angew. Chem.* 31, II, 331(1918); *J. Soc. Chem. Ind.* 38, 11-2A.—The potash liquors employed in  $CO_2$  factories accumulate impurities, the chief of which is  $K_2SO_4$ , derived from  $SO_2$  present in the gas. In course of time the accumulation of sulfate becomes sufficiently large to interfere with the efficiency of the liquor and obstructions may occur in the plant through the crystn. of the sulfate in the cooler portions. The sulfate can be removed by evapg. the liquor, but it is far better to avoid its formation. This may be done by passing the gas through a scrubbing tower packed with limestone. If the scrubbing is performed by a weak soln. of  $Na_2CO_3$  instead of water, the removal of the  $SO_2$  is more complete, or if soda is not available, a suspension of chalk may be used. E. J. C.

**Heat technology applied to solution and cooling in the preparation of potassium chloride from crude potassium salts.** KRULL. *Kali* 11, 307-16(1917); *Z. angew. Chem.* 31, II, 303(1918); *J. Soc. Chem. Ind.* 37, 731A.—The sepn. of KCl from crude K salts, depending upon the different solubilities of KCl and NaCl at different temps., is essentially a problem of applying and extg. heat. According to the constitution of the crude salts, extn. is effected at 90-130° and the soln. is cooled to 15-25°. Enclosed steam is usually employed in the extn. process, the liquor being warmed to 70° in pre-heaters, and then heated to 90-115° in the extn. vessels. Low-pressure exhaust steam is used. In cooling the liquors, the main object is to produce a high yield of well defined crystals. Heat may or may not be recovered during the process; preferably, the liquor is cooled to a low temp. without the recovery of heat. Salts pptd. at lower temps. are somewhat contaminated with sulfate, but these may be profitably employed in the manuf. of sulfates; on the other hand, the quality of the liquor is improved for use again in the extn. process by the removal of sulfates. The cooling boxes formerly employed yielded a product excelled by no other method; on the other hand, they possessed great

disadvantages in their low output and the necessity for removing the product by hand. Cooling by stages only partly remedied this defect. E. J. C.

**The potash industry of Canada.** E. B. BIGGAR. *Trans. Am. Inst. Chem. Eng.* 10, 85-103.—Up to the development of the Stassfurt deposits  $\frac{2}{3}$  to  $\frac{3}{4}$  the world's potash came from Canadian "pot-ash" and "pearl-ash." Only 500 bbls. per year have been produced in recent times. Discussion brought out methods of inverse multiple-effect evapn. and electrically compressed steam expts. for saving latent heat in chem. engineering work. Western kelp and lake water utilization details are brought out. J. R. W.

**Potash salts in Hungary.** F. VON KONEK-NORWALL. *Chem. Ztg.* 42, 365-7 (1918); *J. Soc. Chem. Ind.* 37, 544A.—Large quantities of alunite occur in Northern Hungary. The  $K_2SO_4$  may be recovered by roasting at a red heat until all the  $Al_2(SO_4)_3$  has been decomposed and  $H_2SO_4$  fumes are no longer evolved. The residual mass consists of  $K_2SO_4$  (14 to 15%), alumina, and frequently a considerable quantity of silica; it forms a white powder and may be used directly on the land, but when it has to be transported for a distance it is more economical to ext. it with water and sep. the  $K_2SO_4$  by crystn. from the soln. The mixt. of alumina and silica may be used in the manuf. of porcelain, or the alumina converted into alum for use in the textile trades, the  $H_2SO_4$  for making the alum being obtained by condensing the vapors which are given off when the original mineral is roasted. E. J. C.

**Utilization of kaolin rich in iron for manufacture of alum or aluminium sulfate.** J. MILBAUER AND F. SKUTIL. *Chem. Ztg.* 42, 525-7 (1918); *J. Soc. Chem. Ind.* 37, 765A.—For the manuf. of alum or  $Al_2(SO_4)_3$  from kaolin contg. a large proportion of Fe, the best method consists on heating the mineral at  $700^\circ$  with the addition of sawdust; air must be excluded during the heating. The calcined material is then heated with  $H_2SO_4$  ( $50^\circ$  Bé., sp. gr. 1.53); the  $FeSO_4$  remains in soln. when the  $Al_2(SO_4)_3$  is sep'd. by crystn. Traces of ferric salts may be removed from the  $Al_2(SO_4)_3$  soln. by adding  $K_4Fe(CN)_6$  and filtering, a small quantity of kieselguhr being added to facilitate the filtration. If, after the Fe salts have been reduced, the  $Al_2(SO_4)_3$  is allowed to crystallize in an atm. free from O, the crystals obtained contain but very little Fe. E. H.

**Production of alumina in the aluminium industry, with special reference to the rotary kiln.** W. VON ESCHER. *Chem. Ztg.* 42, 361-2 (1918); *J. Soc. Chem. Ind.* 37, 544A; cf. *C. A.* 12, 2300.—A type of rotary kiln especially adapted to drying and dehydrating  $Al(OH)_3$  contg. 45-50% total  $H_2O$ , is described. Owing to the high temp. required,  $1500-1550^\circ$ , the kiln differs considerably from the type used in the cement industry. It consists essentially of 5 parts, a feeding device, the kiln proper, a cooler for the hot alumina, an automatic device for weighing and delivering the product into sacks, and a dust-collecting equipment for recovering dust from the escaping gases. The kiln is fired with producer or natural gas, the air being preheated and supplied under pressure. The losses are very small (under 1%). The dehydrated alumina should have a loss on ignition of at most 0.15%. E. J. C.

**The production of nitrogen compounds.** JACK P. MONTGOMERY. *Univ. Alabama. Chem. Eng.* 27, 35-9 (1918).—The various methods in use at present, for the fixation of atm. N and their importance in peace time as well as in war time are discussed.

PHILIP CYRULL.

**The conditions for using the Schilling apparatus for the control of industrial hydrogen.** F. BOURION AND CH. COURTOIS. *Compt. rend.* 168, 232-5 (1919).—In detg. the ascensional force of industrial H by the Schilling app. (based on Graham's law), the calculation as usually made is correct only for the dry gas, whereas the gas is generally satd. with  $H_2O$ -vapor. From detns. made at intervals during a yr., the

authors have prepd. a table of corrections, the application of which gives an abs. value regardless of the gaseous impurity. F. W. SMITHER.

**Recovery of volatile inflammable solvents in industrial operations.** QUIRINO SESTINI. *Bergaus. Ann. chim. applicata* 10, 117-30(1918).—Among the particular operations considered was the continuous treatment of fabrics for rendering them impervious, or treatment with medicating solns. Methods hitherto employed for recovering volatile solvents, generally involving the use of a hood connected with an aspirator, are defective (1) because, depending upon the aspiration of large quantities of air, they recover the solvent with difficulty and leave behind the greater part of it in the state of vapor satg. the aspirated air; (2) because the hoods are placed above the treated and subsequently heated fabrics although the vapors of the solvents employed always have a d. considerably greater than that of air. Detailed procedure and the app. for prepg. gauze impregnated with  $\text{CHI}_3$  with a little colophony and vaseline, and recovering the  $\text{Et}_2\text{O}$  used as solvent are described. For evapg. the solvent recourse was had to elec. heating. Vapors of  $\text{Et}_2\text{O}$  in presence of air and in contact with metallic wires (Fe, Cu, Ni) produce considerable amts. of acid, irritating vapors of an aldehydic odor. Further expts. showed that  $\text{Et}_2\text{O}$  in contact with a metallic surface heated above  $300^\circ$  and in presence of air, oxidized completely to acetaldehyde, and if the air was in greater abundance, to formaldehyde. (S. suggests that this observation be made the basis of a test for traces of  $\text{Et}_2\text{O}$  in other volatile substances, i. e., passing the first vapors produced together with air through a tube containing an Fe wire heated by means of an elec. current.) For the purpose in question, a heating app. consisting of circulating oil of high flask point (transformer oil) was used. Starting from a heater box in which was placed the coil of wire through which passed the heating current, oil circulated from the top of this box down and up through a U-pipe and was raised up into a reservoir high above the level of the oil in the heater box by injected compressed air that enters the ascending branch of the U near the bottom. From this reservoir the oil passed through spiral heating coils of pipe placed in the drying chamber, the cloth passing near the spiral coils. The injected air was the compressed air from the condensing app. of the system and was satd. with  $\text{Et}_2\text{O}$  vapor. The reservoir was open to the drying chamber which had a vol. of  $6 \text{ m}^3$ . There was required  $\frac{3}{4}$  hr. to bring the temp. of the atm. in the chamber to  $60^\circ$ , using 15 kw. of current. For continuous work 10 and later 5 kw. were sufficient. The recovery system consisted of 3 enclosed chambers. The first was small and contained the glass vessel with the  $\text{Et}_2\text{O}$  soln. through which the gauze was passed. The second chamber was the drying chamber with the heating app. above described. The vapors were condensed by 2 coil condensers in series, the first cooled by water and the second by ice. The app. recovered from 50 to 80% of the solvent, averaging 70%. The production of gauze amounted to 5000 m. per day. The  $\text{CHI}_3$  is often slightly altered by the heat, tinting the gauze green. To remedy this, 3% resorcinol is generally added to the soln. Diphenylamine was found to be a good substitute for resorcinol. Later the alteration of the  $\text{CHI}_3$  was found to be due to traces of  $\text{EtHSO}_4$  contained in com.  $\text{Et}_2\text{O}$ , and avoided by neutralizing the  $\text{Et}_2\text{O}$  with alc. alkali. Glycerol was substituted for the vaseline used, improving the quality of softness of the gauze produced, and requiring much smaller quantities. ROBERT S. POSMONTIER.

**Condensation products in Germany.** ANDRE DUBOSC. *Caoutchouc & gutta-percha* 16, 9709-10(1919).—The firm of Truan and Sons, of Hamburg, has published a description of a new insulator, which it has named "Paturau." D. states that this material is none other than Bakelite. JOHN B. TUTTLE.

**Observations on the drying of Indian products.** P. E. VERKADE. *Ind. Merc.* 41, 109-11(1918); *Chem. Weekblad* 16, 79-80(1919).—A discussion of the methods in cur-

rent use for drying various articles, as copra and others, produced in the Dutch East Indies.

JULIAN F. SMITH.

PEELE, ROBERT: *Compressed Air Plant*. 3rd Ed. New York: John Wiley & Son. 485 pp. \$4.25. For review see *Mining Sci. Press* 118, 482(1919).

Syndicat général des produits chimiques: *l'Industrie chimique et les droits de douanes*. Paris: 61 Rue de l'Arcade. 87 + CCLXXX p.

The value of sulfur in ores (PAUL) 9. Apparatus for the extraction of liquids in towers filled with Raschig's rings (RASCHIG) 1. Utilization of the ash of pyrites in Italian steel making (LORTI) 9. Graphs for calculating the revivification of spent acids (FOWLER) 24. Flue dust (VOELCKER) 15. The limits of separation by fractional distillation (DURFON) 1.

Nitric acid by oxidation of ammonia. W. S. LANDIS. U. S. 1,292,814, Jan. 28. N oxides for the manuf. of  $\text{HNO}_3$  are obtained by the catalytic oxidation of  $\text{NH}_3$  mixed with sufficient air enriched in O to render the reaction self-sustaining. Using a gas containing 30-40% O (as may be obtained by fractionating liquid air) as the oxidizing medium, a nitrous gas of 12-20% concn. may be obtained by the oxidation of  $\text{NH}_3$ . The latter may be produced by the action of steam on  $\text{CaCN}_2$ .

Concentrating nitric acid. F. C. ZEISBERG. U. S. 1,292,948, Jan. 28. Acid mixts. containing 64% or more of  $\text{H}_2\text{SO}_4$  and from 3% to 25%  $\text{HNO}_3$ , such as spent acids from nitrating cellulose, are treated with a current of hot gases and steam and the  $\text{HNO}_3$  vapors are carried away and condensed. A concg. tower for carrying out this process is illustrated and described.

Concentrated nitrous gases. O. JENSEN. U. S. 1,291,909, Jan. 21. Concd. N oxides are obtained by absorbing dil. nitrous gases in strong  $\text{H}_2\text{SO}_4$  and subsequently driving out nitrous gases from the nitrosylsulfuric acid by heating. The  $\text{H}_2\text{SO}_4$  used is of about 90% strength and with acid of this concn. the acid may be freed almost completely of N oxides by merely heating without the addition of either denitrating substances or of  $\text{H}_2\text{O}$ . Dephlegmation of the vapors from this heating operation is effected by an app. through which the nitrous vitriol flows downwardly to the heating vessel. If  $\text{H}_2\text{SO}_4$  of concn. materially above 90% is used, the denitration of the acid is much less complete, while the use of acid of lower strength lowers the amt. of nitrous gases dissolved by it. By this process of absorption and distn., dil. nitrous gases from an elec. furnace may be obtained as concd.  $\text{N}_2\text{O}_4$  without diln. of the  $\text{H}_2\text{SO}_4$  so that the latter may be immediately reused for absorption. When the concd. gases are absorbed in  $\text{H}_2\text{O}$  with a supply of air,  $\text{HNO}_3$  of 67% concn. is readily obtained. The gases produced are also adapted for use in producing liquid  $\text{N}_2\text{O}_4$ .

Sulfur trioxide. W. H. SEAMON. U. S. 1,292,098, Jan. 21. Equimol. proportions of  $\text{Na}_2\text{SO}_4$  and  $\text{CaSO}_4$  and 2 mol. proportions of  $\text{SiO}_2$  are heated to a temp. sufficient to form Na Ca silicate in a fused condition and liberate substantially all the S present in the form of  $\text{SO}_3$ . This reaction may be effected in a reverberatory furnace (fired with coal, gas or oil) and the gaseous products carrying the  $\text{SO}_3$  are led off to an absorption app. in which the  $\text{SO}_3$  is absorbed in  $\text{H}_2\text{SO}_4$  or  $\text{H}_2\text{O}$ . The flame which comes into contact with the mixt. of sulfates and  $\text{SiO}_2$  should be of a slightly oxidizing character, reducing agents being avoided to prevent formation of  $\text{SO}_2$ . The mixt. of sulfates employed may be the natural deposit of Na and Ca sulfates found in N. Mex.

Separating nitrates from associated impurities. H. S. COX. U. S. 1,292,580, Jan. 28. Niter is recovered from natural deposits or from residues of industrial operations by dissolving the niter from the material at a temp. of 50-70° with a soln. which

is satd., when cold or moderately warm, with niter and with sol. impurities of the niter-bearing material, cooling the soln. thus obtained to produce impure niter crystals, digesting these crystals at a temp. of 100–120° with a soln. which, when cool or moderately warm, is satd. with niter and impurities and then crystg. niter from the soln. obtained by this digestion.

**Soluble compounds of potassium from glauconite.** F. TSCHERNER. U. S. 1,292,929, Jan. 28. Glauconite 2000, is mixed with "limesand" (which contains about 71%  $\text{CaCO}_3$  and 14%  $\text{SiO}_2$ , together with compds. of Mg, Fe, Al and K) 1000–1600 and NaCl 700 parts and the mixt. is finely ground and passed through a rotary kiln in which it is heated to 800–820° to oxidize Fe compds. while avoiding material clinkering or volatilization of K compds. The mixt. is then further heated in a muffle and dropped into a "soaking pit" in which it is allowed to remain for an hr. to permit completion of reactions initiated and the product is afterward leached with  $\text{H}_2\text{O}$  and KCl and NaCl separately crystallized out. Cf. C. A. 12, 2668.

**Removing silica from calcined alunite.** C. H. MACDOWELL and P. R. HERSEMAN. U. S. 1,291,979, Jan. 21. Raw and calcined alunite is freed from silica by mixing it with C and heating the mixt. to a temp. sufficient to volatilize the silica (above 1650°) in an inert atm. NaCl may be added to effect removal of Fe.

**Separating tungsten compounds from solutions.** C. ANDERSON and E. H. WESTING. U. S. 1,292,559, Jan. 28. W is pptd. from solns. such as those of  $\text{Na}_2\text{WO}_4$  or  $(\text{NH}_4)_2\text{WO}_4$  by the addition of a ferric salt and an alkali metal hydroxide, such as  $\text{Fe}_2(\text{SO}_4)_3$  and NaOH, to form ferric tungstate.

**Bromine from gas mixtures.** C. E. MURRELL. U. S. 1,292,016, Jan. 21. Gas mixts. containing Br, *e. g.*, gases from blowing brines with air, are treated with  $\text{NH}_3$  to form a fume of  $\text{NH}_4\text{Br}$  and the fume is pptd. electrically.

**Zinc oxide from ore.** D. B. JONES. U. S. 1,292,330, Jan. 21. Zn ore is formed into spherical briquets with reducing material and the briquets are fed by gravity along an inclined way through a preheating chamber to a furnace, heated sufficiently to expel their Zn contents in the form of vapor and supplied with sufficient air to convert the vapor into  $\text{ZnO}$ .

**Calcining granular materials with gaseous fuel.** C. D. McCOURT. U. S. 1,291,965, Jan. 21. In calcining  $\text{CaCO}_3$ , ores or other granular material, the charge is fed continuously through a furnace chamber and heated by burning within the material an explosive gaseous mixt. fed to the charge at a speed greater than that of backfiring. A reagent such as Cl or HCl may be supplied to the charge in the furnace for effecting chemical reaction with it, *e. g.*, for the production of chlorides of metals in the ore treated.

**Coating valves and cylinder walls of gas engines.** J. F. SMITH. U. S. 1,292,903, Jan. 28. A mixt. for removing C from and forming a smooth coating upon the walls of cylinders and valves of internal-combustion engines is formed of  $\text{ZnO}$  2,  $\text{NH}_4\text{Cl}$  1, and  $\text{H}_2\text{O}$  128 parts. The mixt. is introduced into the engine in small amts. while the engine is running. Small amts. of Venetian red and  $\text{NH}_4\text{OH}$  also may be included in the mixt. A smooth, bright coating is said to be formed on the walls of the engine which improves inequalities of the surface and resists the deposition of C in the cylinders.

**Fire-extinguishing solution of low freezing point.** G. E. FERGUSON. U. S. 1,292,743, Jan. 28.  $\text{CCl}_4$  is mixed with aniline or a similar amino compd. to lower its freezing point. U. S. 1,292,744 relates to the similar use of ethyl benzoate instead of aniline.

**Composition for coating water pipes.** W. A. RUDDELL. U. S. 1,292,964, Jan. 28. A mixt. of paraffin 40, petrolatum 40 and alc. 20 parts is used for coating water

pipes, radiators or tanks to prevent "sweating" or freezing from too rapid cooling on standing.

**Composition for holding diamonds during abrasive treatment.** C. J. COLEMAN. U. S. 1,291,769, Jan. 21. A compn. for use as a matrix for holding diamonds during cutting and polishing is formed of Fe carbide 13, borax 2 and  $\text{WO}_3$  3 parts. The heat developed during the polishing does not cause the diamond to loosen from the compn.

**Adhesive.** A. E. JURY. U. S. 1,292,333, Jan. 21. An adhesive for uniting fabrics is formed of an emulsion containing castor oil, dextrin and  $\text{H}_2\text{O}$ .

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**Enamels for cast iron.** HOMER F. STALEY. *J. Am. Ceram. Soc.* 1, 703-9(1918); cf. C. A. 13, 253.—*I. Tin enamels:* Two formulas are given for leadless, 2 for low-Pb, and 3 for high-Pb types. All are expressed in 3 ways, batch wts., % compns. and empirical formulas. *II. Antimony Enamels:* Typical formulas are given for 1 leadless, 1 low-Pb, and 2 medium-Pb mixts. using (1)  $\text{NaSbO}_3$  and also (2)  $\text{Sb}_2\text{O}_3$ . The mixts. are practical com. batches. C. H. KERR.

**A method for the determination of air in plastic clay.** H. SPURRIER. *J. Am. Ceram. Soc.* 1, 710-5(1918).—Pug mill treatment may introduce harmful amts. of air. A simple volumetric app. is described. The value of the detn. is shown by the tests in which increase from 9.6 to 13.2% air by vol. was caused by 5 puggings. C. H. KERR.

**Notes on sagger clays and mixtures.** G. H. BROWN. *J. Am. Ceram. Soc.* 1, 716-29(1918).—Causes of sagger failure are described and classified. A good av. mixt. is 50% grog, 20% vitrifying bond clay, 30% open-burning clay. Deformation at kiln temps. is not one of the most important causes of failure. An excess of sandy clay is a common cause of cracking. A small addition of kaolin or similar open-burning clay is often beneficial. For preparing the mixt. a wet pan, preferably with the mullers raised slightly from the bottom is recommended. Drying and first burning are of great importance. C. H. KERR.

**A contribution to the methods of glass analysis with special reference to boric acid and the two oxides of arsenic.** E. T. ALLEN AND E. G. ZIGS. *J. Am. Ceram. Soc.* 1, 739-86(1918).—An accurate method for  $\text{As}_2\text{O}_3$  and  $\text{As}_2\text{O}_5$  is given. The sepn. depends upon the volatilization of trivalent As as  $\text{AsF}_3$  when the glass is heated with  $\text{HF} + \text{H}_2\text{SO}_4$  while the pentavalent As remains in the residue. The latter is pptd. as sulfide, then oxidized to  $\text{H}_3\text{AsO}_4$ , reduced by HI and titrated with a standard I soln. The trivalent As is detd. by difference. Total As is detd. by fusing the glass with  $\text{Na}_2\text{CO}_3$  and  $\text{NaNO}_3$ , removing the  $\text{SiO}_2$  and excess  $\text{HNO}_3$  by evapn. with  $\text{H}_2\text{SO}_4$  and filtering; it is then pptd. as sulfide and treated as above. The iodometric method is preferable to the  $\text{MgHAsO}_4$  method. Chapin's method (cf. C. A. 3, 406) for  $\text{B}_2\text{O}_3$  is reliable. Accuracy is affected by large amts. of  $\text{As}_2\text{O}_3$  but not by  $\text{As}_2\text{O}_5$ . If the  $\text{As}_2\text{O}_3$  is large in amt. the soln. should be oxidized by  $\text{H}_2\text{O}_2$  after making alk. with NaOH and it will not then interfere. For very accurate work large amts. of fluorides interfere but for ordinary work this can be ignored. Details of a method for minute quantities of Fe are given. Ten Jena optical glasses show from 0.011 to 0.020%  $\text{Fe}_2\text{O}_3$  while 4 Am. optical glasses show 0.029 to 0.046%. Details of a method for Zn are given, also methods for the sepn. and detn. of Pb and Ba occurring together and for the sepn. and detn. of Ca or Ba occurring with large amt. of Al and very little Fe. The detn. of  $\text{H}_2\text{O}$  is important in accurate work for carefully prepd. powdered samples of glass show 0.03



to 0.20%  $H_2O$  while 2 samples left in a grinder for several hrs. showed 0.68 and 0.88%  $H_2O$ . Glasses are shown to contain an appreciable amt. of gas, most of which is not included in any way in an ordinary analysis. One Na-Ca glass gave 6.55 cc. gas from 6.577 g. of glass and the gas contained  $O_2$ , 64.2;  $CO_2$ , 24.2;  $CO$ , 3.5;  $H_2$ , 3.9;  $N_2$ , 4.1, in addition to some  $SO_2$ . The occurrence of gases is briefly discussed. The following table shows analyses of important optical glasses:

## Schott

| No.       | O 3832 | O 154  | O 144  | O 167  | ....   | O 2071 | O 1209 | O 227  | O 0722 | O 578  |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| nd        | 1.5164 | 1.5711 | 1.5100 | 1.6163 | 1.6162 | 1.6091 | 1.6095 | 1.5409 | 1.5795 | 1.5832 |
| $\nu$     | 64.0   | 43.0   | 64.0   | 36.6   | 36.6   | 58.8   | 56.8   | 59.6   | 53.8   | 46.3   |
| $SiO_2$   | 69.58  | 54.75  | 72.15  | 46.12  | 46.32  | 34.56  | 40.17  | 59.13  | 45.02  | 49.80  |
| $B_2O_3$  | 9.91   | 0.45   | 5.88   | ...    | ...    | 10.96  | 5.96   | 3.04   | 4.50   | ...    |
| $As_2O_3$ | 0.22   | 0.14   | 0.20   | 0.25   | none   | 0.55   | 0.49   | 0.34   | 0.55   | 0.51   |
| $As_2O_5$ | 0.09   | 0.06   | 0.08   | 0.04   | none   | 0.04   | 0.03   |        | 0.06   | 0.01   |
| $SO_3$    | 0.08   | ...    | 0.12   | 0.10   | ...    | ...    | ...    | ...    | ...    | ...    |
| Cl        | 0.06   | 0.06   | 0.06   | ...    | ...    | ...    | ...    | ...    | ...    | ...    |
| $Na_2O$   | 8.44   | 4.31   | 5.16   | 1.72   | 2.48   | 0.21   | 0.13   | 3.16   | 0.64   | 1.24   |
| $K_2O$    | 8.37   | 7.99   | 13.85  | 6.78   | 5.63   | 0.09   | 0.03   | 9.70   | 6.80   | 8.20   |
| $MgO$     | 0.07   | none   | 0.07   | ...    | trace  | ...    | ...    | ...    | ...    | ...    |
| $CaO$     | 0.07   | 0.05   | 2.04   | 0.07   | 0.25   | ...    | 0.03   | 0.13   | ...    | ...    |
| $BaO$     | 2.54   | 1.64   | none   | ...    | none   | 46.91  | 42.35  | 19.25  | 23.39  | 13.36  |
| $MnO$     | none   | none   | none   | none   | 0.004  | ...    | none   | none   | none   | none   |
| $ZnO$     | none   | 0.06   | none   | ...    | none   | 1.14   | 8.17   | 5.00   | 15.53  | 8.03   |
| $PbO$     | none   | 29.30  | trace  | 45.13  | [45.03 | none   | none   | none   | 4.70   | 18.74  |
| $Al_2O_3$ | 0.04   | 0.04   | 0.04   | 0.06   | 0.02   | 5.02   | 2.79   | 0.11   | 0.09   | 0.05   |
| $Fe_2O_3$ | 0.01   | 0.02   | 0.01   | 0.02   | 0.03   |        | 0.02   | 0.02   |        | 0.01   |
| $H_2O$    | 0.06   | 0.20   | 0.08   | 0.03   | 0.06   | ...    | ...    | ...    | ...    | 0.08   |
|           | 99.54  | 99.97  | 99.74  | 100.32 | 99.82  | 99.48  | 100.17 | 99.88  | 100.28 | 100.03 |

C. H. KERR.

The condition of arsenic in glass and its role in glass-making. E. T. ALLEN AND E. G. ZIES. *J. Am. Ceram. Soc.* 1, 787-90 (1918).—Schott held that glass never contains As in the  $As_2O_5$  form but always as  $As_2O_3$  if present at all. Rosenhain held the opposite. The authors results show in all glasses tested, both plate and optical, that most of the As exists as  $As_2O_3$ , but a portion exists as  $As_2O_5$ . In glass making As is used for 2 purposes, (1) to "whiten" the glass, a function which is not considered in this paper and (2) to aid in fining. Apparently  $As_2O_3$  is oxidized at low temp. and the product formed is stable enough to remain until a high temp. is reached when it slowly dissociates into  $O_2$  and  $As_2O_3$ , both of which aid fining. Analyses of 3 optical, 1 spectacle and 1 plate glass follow:

| Kind of Glass.                   | % $As_2O_3$ taken. | $As_2O_5$ . | Found. $As_2O_3$ . | Total as $As_2O_3$ . | % $As_2O_5$ lost. |
|----------------------------------|--------------------|-------------|--------------------|----------------------|-------------------|
| "T"—Med. flint with 42% $PbO$ .  | 0.48               | 0.38        | 0.05               | 0.38                 | 21                |
| "P"—Light flint with 38% $PbO$ . | 0.40               | 0.35        | 0.05               | 0.35                 | 12                |
| V—Baryta flint with 38% $PbO$    |                    |             |                    |                      |                   |
| + 6% $BaO$ .....                 | 0.26               | 0.23        | 0.03               | 0.23                 | 11                |
| Spectacle Crown.....             | 1.09               | 0.99        | 0.08               | 0.93                 | 15                |
| Plate Glass.....                 | 0.36               | 0.18        | 0.09               | 0.24                 | 33                |

C. H. KERR.

The baby milk bottle a possible cause of lead poisoning. GUERBET. Rouen. *J. pharm. chim.* 18, 291-3 (1918).—Milk sterilized in certain bottles of crystal glass that were well made and durable, turned yellowish gray, and a brownish ppt. formed, firmly adhering to the inner wall even after rinsing. Chem. detn. of Pb by Meillère's method (*C. A.* 9, 1590) in milk sterilized on the boiling water bath for 20 min. in the incriminated bottles showed from 3 to 9 mg. of Pb per l., while milk bottles of ordinary

glass yielded no Pb to milk. The Pb in the glass is attacked with formation of PbS only in alk. media, or in presence of chlorides. S. WALDBOTT.

**Phosphoric acid glasses and glazes.** H. FRITZ. *Chem. Ztg.* 42, 422(1918); *J. Soc. Chem. Ind.* 37, 655A.—Glasses and glazes were prepd. from mixts. of Pb oxide, alkalis, lime, BaO or ZnO, and  $P_2O_5$  or a phosphate. When a phosphate was used the products were not clear, but when  $P_2O_5$  was used they were mostly clear and occasionally brilliant. In some cases the introduction of 0.15 mol. of  $Al_2O_3$  made a turbid glass or glaze clear. Most of the glazes prepd. with  $P_2O_5$  were subject to "crazing." Brilliant glazes free from crazing were obtained, however, with a mixt. of the compn. (0.1  $K_2O$ , 0.1  $CaO$ , 0.8  $PbO$ ), 0.2  $Al_2O_3$ , 2  $P_2O_5$ . C. H. KERR.

**Silica products.** A. BIGOT. *Chimie & industrie* 1, 712-23(1918); cf. C. A. 13, 778.—Certain gray quartz rocks form a brownish glaze on the surface at  $1650^\circ$ , but if heated to  $1710^\circ$  the glaze is absorbed and the product comes out white and mat. The difference between original Normandy rock (a), and the fine material (b) (what remains in suspension in  $H_2O$  when 200-mesh powder is decanted) is shown: free  $SiO_2$  (a) 95.95, (b) 76.90; combined  $SiO_2$  (a) not detd., (b) 9.50;  $Al_2O_3$  (a) 2.65, (b) 7.60;  $Fe_2O_3$  (a) 1.96, (b) 0.95;  $CaO$  (a) 0.15, (b) 0.35;  $MgO$  (a) 0.08, (b) 0.20; ign. loss (a) 1.20, (b) 3.12;  $CO_2$  (a) not detd., (b) 0.08. This shows about 7-7.5% clay content in the original rock and 21-22% in the decanted part. The decanted part shows 1.5% contraction when burned at  $1250^\circ$  and  $4\frac{1}{2}\%$  at  $1600^\circ$ . At  $1600^\circ$  it is covered by a brownish glaze which remains until fusion. Cones of the original rock ground to 200 mesh deform at  $1720^\circ$  and the addn. of 2%  $CaO$  makes no change; the decanted part deforms at  $1680^\circ$  and the addn. of 2%  $CaO$  lowers the deformation point to  $1630^\circ$ . Products from such rocks are made up of 2 ingredients, (1) the rock grains which expand with temp. increase and (2) the binder which begins to contract at  $1250^\circ$ . Too much  $Al_2O_3$  is harmful, but if the rock contains no  $Al_2O_3$ , a little must be added. In testing raw  $SiO_2$  materials they are heated to  $1710^\circ$ . They should not fuse nor crumble into small particles. Many French quartzites expand between 10 and 15% at  $1710^\circ$ . Those of lower expansion are preferable. D. is detd. by sp. gr. balance. Porosity is detd. by  $H_2O$  absorption.  $SiO_2$  deposits usually vary greatly and such variations in deposits are of greatest importance in manufacturing. It is shown that the gray parts of bricks containing only 85%  $SiO_2$  are as refractory and useful as the part containing 95%  $SiO_2$ , and they are more resistant to crushing. The  $CaO + Fe_2O_3$  in high grade  $SiO_2$  bricks is usually considered excessive over 3-4% but the gray parts contain 10-14%. The following table shows typical data. A = brick, good quality; B = brick which crack at high temp.; C = brick made from rock which crumbles at high temp.; D = brick from Martin furnace, part not attacked; E, like D, brown part; F = like D, gray part:

|                                                                                         | A.           | B.           | C.           | D.           | E.           | F.           |
|-----------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Fusion temp.....                                                                        | $1750^\circ$ | $1730^\circ$ | $1730^\circ$ | $1730^\circ$ | $1710^\circ$ | $1730^\circ$ |
| Expansion at $1710^\circ$ (in %).                                                       | 1.60         | 5.90         | 4.00         | 2.50         | n. d.        | n. d.        |
| Porosity ( $H_2O$ absorption).                                                          | 12.0         | 9.5          | 10.0         | 10.5         | 2.1          | 0.3          |
| Porosity after heating to $1710^\circ$ .....                                            | 9.7          | 16.1         | 12.0         | 9.0          | n. d.        | n. d.        |
| Crushing strength, kg. per sq. cm.,<br>ord. temp.....                                   | 121          | 480          | 160          | 166          | 1115         | 1415         |
| Crushing strength, after heating to<br>$1710^\circ$ .....                               | n. d.        | nil          | 52           | n. d.        | n. d.        | n. d.        |
| Crushing strength, kg. per sq. cm.<br>at $1500^\circ$ after heating to $1710^\circ$ ... | 77           | nil          | nil          | 37           | 52           | 138          |

C. H. KERR.

**Magnesia ware.** TRYGVÆ D. YENSEN. *J. Am. Ceram. Soc.* 1, 730-3(1918).—MgO was fused, crushed and made into crucibles at the Univ. of Wisconsin before 1910. Since 1912 Yensen has been making MgO crucibles regularly. MgO is fused in an arc furnace, crushed to 40-mesh, mixed with 5% Mg(OH)<sub>2</sub>, molded in a steel mold, dried and finally heated to 1800° in an elec. furnace. Impurity is usually about 5%. Crucible manufacturers have not yet taken up com. production. C. H. K.

**Determination of crushing strength of refractory materials.** A. BIGOT. *Chimie & Industrie* 1, 723-6(1918).—The Bodin method was used and the special furnace is briefly described. Test pieces were 20 mm. cubes. Two general classes of materials were found, (1) those showing a decided max. in the strength curve at about 1000°, including SiO<sub>2</sub>, clay, bauxite and SiC mixts., and (2) those showing no max. at 1000°, including MgO, chrome, etc. The curves are remarkable. The nature of failure was observed—with increasing strength toward the max. the breaks were clean cut; with decreasing strength beyond the max. the failure was a sort of flowage much like that of a plastic material. C. H. KERR.

**The partial purification of zirconium oxide.** A. J. PHILLIPS. *J. Am. Ceram. Soc.* 1, 791-800(1918).—Sintering with Na<sub>2</sub>CO<sub>3</sub> was too tedious and not complete enough to give under 0.1% Fe<sub>2</sub>O<sub>3</sub>. Roasting with NH<sub>4</sub>Cl or NaCl was unsatisfactory. Many trials with all sorts of material were made. The final method was to bubble Cl<sub>2</sub> through hot H<sub>2</sub>O and pass it through a vertical retort heated to about 900° containing the zirconia mixed with about 4% finely powdered petroleum coke and molded into small balls. C. H. KERR.

**Zirconia.** Its use as a refractory, an opacifier and an abrasive. A. GRANGER. *Mon. sci.* 9, 5-14(1919).—As a lab. material ZrO<sub>2</sub> is old (Klaproth, 1789), but as a com. product it is very new. The various ZrO<sub>2</sub> ores are described and analyses of 7 are given. The chief ore is zircon. The Brazilian deposit marketed by Foote Mineral Co. is described. Lab. processes for recovering Zr are given. ZrO<sub>2</sub> fuses above 3000° and even with 1.25% SiO<sub>2</sub> + Fe<sub>2</sub>O<sub>3</sub> the m. p. is above 2500°. The coeff. of expansion is  $8.14 \times 10^{-7}$  compared with SiC =  $6.4 \times 10^{-6}$  and alundum =  $7.1 \times 10^{-8}$ . ZrO<sub>2</sub> is very inert chemically and even at 3000° an equimolecular mixt. with SiO<sub>2</sub> shows very little reaction—the SiO<sub>2</sub> has fused and penetrated the ZrO<sub>2</sub>. The most important reaction is its tendency to form carbide, especially in a C elec. furnace. Its sp. cond. changes with temp. from 0.0008 at 1200° to 0.0034 at 1400°. The literature on ZrO<sub>2</sub> as a refractory is exhaustively reviewed (cf. Rieke, C. A. 2, 1746; Wedekind, *Mon. Sci.* 78, 247(1913); Weiss and Lehmann, C. A. 4, 1283; Bayer, *Ibid* 4, 1527; Ruff, *Ibid* 8, 2609; 11, 2633; Podszus, *Ibid* 11, 2838; H. C. Meyer, *Ibid* 12, 9, 362, 2136). The use of ZrO<sub>2</sub> as an opacifier has been studied but little. It is too costly for present use. The cost might be warranted if unusual resistance to acid were developed or other great advantage. As an abrasive it is not especially promising because of its chem. inactivity. The usual silicate bonds are not satisfactory and cement bonds are the only ones available. The chief future of ZrO<sub>2</sub> is in the field of metallurgical refractories. Also in *Chem. News* 118, 115-8, 121-3(1919). C. H. KERR.

**The composition of Chinese celadon pottery.** J. S. LAIRD. *J. Am. Ceram. Soc.* 1, 675-8(1918).—A lump of glaze (a) found on the floor of an old Chinese kiln and the glaze (b) and body (c) of a saucer of the Yuan period analyzed: SiO<sub>2</sub> (a) 72.52, (b) 66.40, (c) 63.20; Al<sub>2</sub>O<sub>3</sub> (a) 10.59, (b) 13.88, (c) 28.30; Fe<sub>2</sub>O<sub>3</sub> (a) 0.41, (b) 0.30, (c) 3.47; FeO (a) 2.02, (b) 1.19, (c) —; CaO (a) 8.48, (b) 11.58, (c) 2.05; MgO (a) 1.24, (b) 1.61, (c) trace; K<sub>2</sub>O (a) 3.77, (b) 4.25, (c) 1.98; Na<sub>2</sub>O (a) 1.48, (b) 1.84, (c) 0.37; MnO (a) trace, (b) trace, (c) trace; TiO<sub>2</sub> (a) trace, (b) trace, (c) trace; P<sub>2</sub>O<sub>5</sub> (a) 0.21, (b) —, (c) trace. Other analyses previously published by Vogt are given. C. H. KERR.

**Notes on certain characteristics of porcelain.** A. V. BLEININGER. *J. Am. Ceram. Soc.* 1, 697-702(1918).—The wide variation in physical properties are explained by the various stages of development in the different types. In low-fired porcelains (about cone 10) the amt. of undissolved quartz is large and that of sillimanite small. Sanitary ware manufacturers use French flint, not quartz, which is a partially amorphous form of  $\text{SiO}_2$  that inverts to cristobalite more quickly than quartz and probably dissolves more readily in fused feldspar. "Dunting" may be due to quartz inversions. In elec. porcelain probably the % free quartz must be low to give max. stability. Expts. replacing quartz by clay and by synthetic sillimanite showed increased stability, high mechanical strength, increase in firing range and sounder bodies. Other minerals not subject to transformations were also promising.  $\text{ZrO}_2$  was especially good for mechanical strength. Expts. showed that feldspar is the important factor in lowering elec. resistance at the temps. used in the tests, 200-500°. For high-tension wares the feldspar content must be low. For the most severe elec. and heat conditions both quartz and feldspar should be eliminated from the body. C. H. KERR.

**Photographic study of porcelain insulators.** H. G. TUFTY. Univ. Wis. *Elec. World* 73, 268-71(1919).—A study of the microstructure of insulator sections under normal and polarized light showed that the quartz is unaffected by any firing temp. and remains practically const. in all types. The use of some high-fusing feldspar in the place of quartz is suggested. The porosity of all sections was very low. Even in the overfired case it was only 4.7%. No crystal other than quartz was found, disproving the theory that crystn. is often the cause of deterioration. The % of unfluxed feldspar seems to have some relation to the quality of the insulator. The poorer quality insulators have a low % while the good insulators have almost double the % of unfluxed feldspar. Conclusions are only general as the history of the specimens was vague. W. E. RUDER.

**Tests of hollow building tile.** BERNARD D. HATHCOCK AND EDWARD SKILLMAN. Bur. of Standards, *Tech. Paper* 120.—The principal tests discussed are those of compression and absorption which together total about 250. Strain readings were taken upon some of these with an 8-in. Berry strain gage for detg. the limit of proportionality and the moduli of elasticity. Besides the compressive strengths and moduli of the tiles, the results show the relationships existing between the moduli of elasticity and the compressive strengths, the colors of the tiles and their compressive strengths, the colors of the tiles and their moduli of elasticity, the percentages of absorption and the compressive strengths, and the percentages of absorption and the colors of the tiles. E. H.

**A discussion of terra cotta dryers.** ELLIS LOVEJOY. *J. Am. Ceram. Soc.* 1, 667-74(1918).—There is great lack of uniformity in dryers and drying methods. The essentials are the use of waste heat, thorough circulation, and humidity control. No present dryer includes all of these. C. H. KERR.

**Operation of continuous kilns.** R. SEYDEL. *Tonind. Ztg.* 42, 482-3(1918); *J. Soc. Chem. Ind.* 37, 622-3A.—The chief difficulties in the operation of a continuous kiln are due to the irregular passage of the air and hot gases through it. This is particularly the case with Hoffmann kilns in which the fuel is burned in hollow pillars formed by the bricks to be burned. If sufficient care be taken to obtain a uniform draught in various parts of the kiln, various auxiliary methods, such as boxing tiles, are unnecessary. Difficulties arise when the finishing point and the point of collapse of the goods lie too close together; the admixt. of fireclay may help to overcome this objection. In a Hoffmann kiln with a tunnel 240-300 ft. in length, of a suitable width, with rounded ends of the same cross-sectional area as the straight portion, and provided with suitable hot-air flues, the fire should travel round at the rate of 33 ft. per

24 hrs. Excellent results may be obtained without difficulty in a wide kiln, with 5 or 6 feed holes, 3 ft.-4 ft. 6 in. apart, and the setting and drawing of the goods is easier than in a narrow kiln. It is important that the area of the rounded ends should be sufficiently large; the reduction usually made at this part of the kiln causes many difficulties in working. The discharge of black smoke from the chimney is an indication that fuel is being applied too soon, or that the air is not hot enough for complete combustion. Sometimes the air is too cool because too much is passing through the kiln; on reducing the quantity no smoke is produced. E. J. C.

Furnaces for the production of high temperatures (BIGOT) 1. Effect of temperature on the resistances of spark-plug insulations (MORGAN) 4.

BOSWELL, P. G. H., HARWOOD, H. F. AND ELDRIDGE, A. A.: **British Resources of Sands and Rocks Used in Glass-Making with Notes on Certain Crushed Rocks and Refractory Materials.** London: Longmans, Green & Co. 183 pp. For review see *Trans. Faraday Soc.* 14, 171(1919); cf. *C. A.* 11, 2032.

**Memoirs of the Geological Survey: Special Reports on the Mineral Resources of Great Britain.** Vol. VI. **Refractory Materials.** London: H. M. Stationery Office. 233 pp. 7s. 6d. net. For review see *Trans. Faraday Soc.* 14, 172(1919).

Glass for cutting off ultraviolet rays. W. C. TAYLOR. U. S. 1,292,147, Jan. 21. Glass for absorbing ultraviolet rays is formed with  $\text{TiO}_2$  as an essential constituent. The glass batch may, e. g., be made up of sand 49-60, soda 21.75-25, niter 4.6-5.2,  $\text{CaCO}_3$  0-6,  $\text{TiO}_2$  4.25-8, Ce nitrate 0-7.7, V oxide 0-0.35, borax 0.67-1 and arsenic 0.4-0.5 part. A clear, brilliant yellow or yellow-green glass is produced suitable for optical uses. U. S. 1,292,148 relates to a similar glass produced from a batch containing 0.8-1% of  $\text{V}_2\text{O}_5$ , other constituents similar to the formula of the preceding pat. and 0.5% of oxide of Mn, Co, Ni or U.  $\text{TiO}_2$  may be used or may be omitted.

"Antislipping" ceramic tile. G. N. JEFFSON and C. F. DIETZ. U. S. 1,292,953, Jan. 28. Fused granules of  $\text{Al}_2\text{O}_3$  of different sizes are embedded in a ceramic clay mixt. in making "anti-slipping" tiles.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

New researches on cement. K. ENDELL. *Z. angew. Chem.* 31, I, 233-4, 238-40 (1918); *J. Soc. Chem. Ind.* 38, 76A(1919).—A survey of German literature on cement published during the past ten years. The raw materials for port. cement do not require special investigation beyond that necessary to secure the correct ratio of  $\text{CaO}:\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$  in the finished product. Only glassy blast-furnace slags, which have been cooled rapidly and granulated, can be used for slag cement. If cooled slowly they fall to a useless cryst. powder. The constitution of port. cement clinker is not definitely established. Cobb has shown (*C. A.* 4, 1092, 1532, 1657, 1798, 2193, 2556) that  $\text{CaCO}_3$ ,  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  can react at 800-1200° without fusion, forming Ca silicates at temps. much below the eutectic temp. Na, Mg, Zn, and Ba silicates and aluminates may also be prepared in similar manner. The incompletely burned and unsintered product in the manuf. of port. cement, though largely sol. in *N* HCl, contains silicates and aluminates which are absorbed on heating to a higher temp. by the ternary and quaternary eutectic formed. Jesser and Dittler (cf. *C. A.* 5, 775) observed first an absorption of heat (i. e., fusion of a eutectic) when cement mix was sintered at 1250-1380°, and the crystn. of the chief constituent did not occur until the material had been

heated to a higher temp.; this crystn. was accompanied by evolution of heat. The triangular diagram summarizing the researches at the Geophys. Inst. at Washington (cf. *C. A.* 5, 1982; 9, 702) is reproduced but it is suggested that, as equil. is seldom reached in burning cement clinker, the phases indicated in the triangular diagram may not occur in com. cement. The influence of Fe oxide, MgO, alkalies, and SO<sub>3</sub> on the position of the various areas in the diagram has not been investigated, though it is known that small percentages of FeO and Mn oxide prevent "dusting." Killig produced sufficiently large amts. of pure Ca aluminates to permit the examn. of their mechanical properties. He confirmed the known high crushing strength of aluminous cement, but found that tri-Ca aluminate expands after being mixed with H<sub>2</sub>O, and suggested that this substance does not occur in good port. cement. The setting and the hardening of cement have been studied microscopically by Ambronn (*C. A.* 5, 776), Kiesermann (*C. A.* 5, 1328), Blumenthal (*C. A.* 8, 2048), and Scheidler (*C. A.* 10, 105). A 0.2% soln. of alizarin orange or cryst. alizarin in dil. ammonia was used to identify lime, a similar soln. of cyanin and chromotrop 2R was used to identify alumina, AcOH for combined SiO<sub>2</sub>, and neutral methylene blue for free silica. After the cement and water had been in contact for 2-3 hrs., hexagonal plates of Ca aluminate were visible around the cement grains; these plates were free from silica. Fine needles of Ca silicate were also formed. After 2-4 days, large, hexagonal crystals of Ca(OH)<sub>2</sub> appeared; in contact with the air these formed spherulites of CaCO<sub>3</sub>. Simultaneously, a gelatinous Ca silicate was formed. It was found that these substances are not simply the hydrated products of compds. present in the clinker, but are new compds. formed by the decompn. of the clinker by the water. The hardening of cement appears to be due to the formation and crystn. of Ca aluminate and silicate and to a gelatinous C silicate which unites the crystals present. The increase in vol. during hardening has been shown by Jesser to be due to the tension of aq. vapor in the air. In regard to the destruction of cement by water, etc., sulfates are harmful, but chlorides are negligible. The absorption of the SO<sub>3</sub> radical from sulfates causes large expansion of the cement and leads to its destruction. Synthetic Ca Al sulfate is decompd. by NaCl, MgCl<sub>2</sub>, and sea water and its formation in sea water is therefore improbable. The expansion of cement in sulfate solns. increases with its content of alumina. Prolonged exposure to the air previous to immersion in the sulfate soln. reduces the expansion, possibly on account of the decompn. of the Ca silicate and hydroxide by the CO<sub>2</sub> in the air. When cement is immersed in a magnesia soln., an equiv. amt. of lime is replaced by magnesia.

C. N. WILEY.

Calcium aluminium sulfate as a concrete destructor. NITZSCHE. *Z. angew. Chem.* 31, I, 195-6(1918); *J. Soc. Chem. Ind.* 37, 734-5A.—A discussion of the formation of the double sulfate of Ca and Al in cement and its deleterious action. The compd. is always formed when a soln. of a sulfate is brought into contact with lime water and pptd. alumina, but it is only stable in presence of free lime. Most natural waters contain sulfate and consequently attack cement, but sea water appears not to lead to the formation of the double Ca Al sulfate. The preventive measures recommended are the coating of the cement with bituminous material, or the modification of the constitution of the cement in such a manner as to prevent the formation of the double sulfate.

E. J. C.

Concrete as a chemical engineering material. M. TOCH. *Chem. Met. Eng.* 20, 222-3(1919).—Editorial review of some of the defects of concrete construction. General summary is given of the types of waterproofing used and methods of protection of concrete against erosion, chemical action, disintegration and decompn.

H. A. BRIGT.

The hydraulic properties of the calcium aluminates. P. H. BATES. *J. Am.*

*Ceram. Soc.* 1, 679-96(1918).—In the  $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2$  system the compds. are  $\text{CaO.SiO}_2$ ,  $3\text{CaO.2SiO}_2$ ,  $2\text{CaO.SiO}_2$ ,  $3\text{CaO.SiO}_2$ ,  $3\text{CaO.Al}_2\text{O}_3$ ,  $5\text{CaO.3Al}_2\text{O}_3$ ,  $\text{CaO.Al}_2\text{O}_3$ ,  $3\text{CaO.5Al}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3.\text{SiO}_2$ ,  $\text{CaO.Al}_2\text{O}_3.2\text{SiO}_2$ ,  $2\text{CaO.Al}_2\text{O}_3.\text{SiO}_2$ ,  $3\text{CaO.Al}_2\text{O}_3.\text{SiO}_2$ . Some exist in several cryst. forms. Burnings were made of all, but only  $2\text{CaO.SiO}_2$  ( $\beta$ -form),  $3\text{CaO.SiO}_2$  and all of the aluminates except  $3\text{CaO.Al}_2\text{O}_3$  developed hydraulic properties. It is a striking fact that  $3\text{CaO.Al}_2\text{O}_3$ , the only aluminate present in portland cement, is not hydraulic. If  $\text{CaO}$  be present also the mix with  $3\text{CaO.Al}_2\text{O}_3$  develops good properties. The compd.  $5\text{CaO.3Al}_2\text{O}_3$  sets very rapidly. Both  $\text{CaO.Al}_2\text{O}_3$  and  $3\text{CaO.5Al}_2\text{O}_3$  set slowly, but harden rapidly, developing great strength in 24 hrs. With 55 to 75%  $\text{Al}_2\text{O}_3$  in  $\text{Ca}$  aluminate burns, a very good cement results. The chief com. drawback is the lack of a widely distributed supply of  $\text{Al}_2\text{O}_3$ . C. H. KERR.

**Decarbonation of dolomite limestone in the rotary kiln.** E. E. EAKINS. *J. Ind. Eng. Chem.* 11, 340(1919).—The contents of a 150-ft. producer-gas-fired rotary kiln were analyzed during a shut-down to det. progress of calcination, results being checked by microscopic examn. and use of White's reagent. Decompn. of  $\text{MgCO}_3$  began about 100 ft. from discharge end, of  $\text{CaCO}_3$  between 30 and 40 ft. and was complete in the last 10 ft. No detns. of temp. could be made. J. S. LAIRD.

**Importance of the valuation of plaster.** E. LINK. *Tonind. Ztg.* 42, 525-6(1918); *J. Soc. Chem. Ind.* 37, 657A.—Heavily adulterated plasters and some plaster substitutes are now on the market in Germany. One of the former examd. by L. was found to consist of plaster of Paris 38.59%,  $\text{CaCO}_3$  20.18%, hydrated lime 39.65%, magnesia 0.45%, and insol. residue 1.12%. It appears to have been made by mixing plaster of Paris with dry slaked lime, the latter having absorbed  $\text{CO}_2$  from the air. Its compn. explains its peculiar behavior when sprinkled into water, the low strength of the plaster, and its softness when set. E. J. C.

**New ingredients for mortar.** H. KÜHL. *Tonind. Ztg.* 42, 17-8, 37-8, 53-4 (1918); *J. Soc. Chem. Ind.* 37, 623-4A.—K. repts. on the use of pure, hydrated lime and hydrated cement (Mühlen, Ger. pats. 293,825 (C. A. 11, 2954) 300,397 and 301,118; cf. *J. Soc. Chem. Ind.* 35, 1109) as ingredients of mortar. Tests of mortar made with hydrated lime (produced by passing slaked lime through an air-separator) showed no expansion. Lime-sand bricks made with this lime are much stronger than those made with ordinary slaked lime. Pure hydrated lime should also meet a wide-felt want in the plaster trade. The coarser siliceous and aluminous particles which are removed from slaked hydraulic lime by an air-separator, yield a good bag lime when ground with quicklime, provided that the additional slaking required by such limes is properly effected. Calcined marl or cement-slurry which has been burned with an excess of lime and then hydrated by steam also produces a non-expanding mortar. The setting time varies with the % of lime and the mode of prepn. of the material. The samples examd. passed the standard tests and also the boiling and hot-water test satisfactorily. Tests of the tensile strength were also satisfactory considering the high % of lime. These new ingredients facilitate the prepn. of new kinds of dry mortars, e. g., mortar of pure hydrated lime, cement mortars, and various mixts. for reinforced concrete. E. H.

**Increasing the resistance of wood paving blocks.** W. RITTER. *Bitumen* 15, 148-50(1917); *Z. angew. Chem.* 31, 308(1918); *J. Soc. Chem. Ind.* 37, 768A.—Wood paving blocks in busy streets require renewal every 5-6 years; attempts have been made to increase their strength by suitable impregnation. Tests were made of crushing resistance calcd. per sq. cm. on prismatic blocks 75.75 sq. mm. in base-area and 120 mm. in height, the pressure being applied in the direction of the fibers. Expts. in which  $\text{Na}$  or  $\text{K}$  carbonate and  $\text{Na}$  silicate in various proportions were added to an impregnating bath of pine wood tar showed no advantage, but increasing the temp. of the bath with

the dry samples gave a 12% increase in strength. Expts. were also made by substituting heavy coal-tar oil for the wood tar at temps. from 112 to 140°. At the higher temp. these trials gave as good results as those with wood tar, but the blocks impregnated at the lower temp. showed a crushing resistance inferior to that of the untreated blocks. Na<sub>2</sub>CO<sub>3</sub> alone, or still better Na silicate alone, gave more favorable test results than the mixt. of carbonate and silicate. The chem. compn. of the impregnating bath, however, is of less importance than its temp. The temp. should not be carried above 200° on account of the danger of splitting the blocks. The best strengthening results are obtained by impregnating for 3 hrs. with gradual increase of temp. up to 200°. A test block showed a crushing strain of 323 kg. per sq. cm. in the untreated condition; this was increased by impregnation at 100° to 330 kg., at 120° to 345, at 140° to 487, at 150° to 516, and at 200° to 536 kg. E. H.

Electrostatic precipitation (BRALEY), (ESCHOLZ) 4. Electric precipitators (THUM) 4. The Cottrell electrostatic recovery process (BUSH) 4. Electric precipitation of fumes (MICHEL) 4.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Fuel economy in the boiler-house. II. JOHN B. C. KERSHAW. *Chem. Met. Eng.* 20, 241-5(1919); cf. C. A. 13, 782.—K. gives illustrations and descriptions of the following automatic CO<sub>2</sub> recorders: Ados or Sarco, Uehling, Simmance-Abady, Cambridge Bi-Meter, Auto, and Mono; and also of the Webster W. R. Combustion Indicator, which is an automatic continuous CO<sub>2</sub> testing app. without any recording device. The Mono Recorder can be used for CO<sub>2</sub>, O, or CO.

III. *Ibid* 291-5. K. describes German types of CO<sub>2</sub> recorders, including the Arndt Gas Balance, the Krell, the Telezometer, the Haber-Loewe Refractometer, and also the thermoscope, this latter not being continuous nor recording in its action. These instruments depend upon the exact measurement of some physical const. of the mixed gases, and are more adapted for scientific observations than for regular use in the boiler house. K. advises checking the results of automatic recorders by occasional analyses of the waste gases, and suggests in this connection the use of an improved Orsat app. and an automatic sampling app. Illustrations of the instruments described are included.

A. G. BLAKELEY.

Methods for more efficiently utilizing our fuel resources. XXVII. Fuel for the merchant marine. F. P. COFFIN. *Gen. Elec. Rev.* 22, 200-12(1919); cf. C. A. 13, 1416.—The necessity of fuel conservation and the installation of all possible labor-saving devices to meet competition in the handling of the world's commerce is noted. Fuel-oil resources are inadequate and the possibilities of using pulverized bituminous coal, pulverized semi-coke, granulated bituminous coal, and granulated semi-coke are discussed, also the means of prepn., advantages and disadvantages of each. Disadvantages of prepg. the fuel on ship board are: the wt. and space required for the pulverizer and for the elevator; the attention required for their operation and maintenance; the coal handling from the bunkers; and the continuance of the dirt nuisance during coaling. By proper diffusion each particle may be surrounded with sufficient air for complete combustion of all available combustible matter, regardless of the % of non-combustible. "Clinkering" or "honeycombing" formation may be chem. or by fusion. "Hard clinker" is formed by the direct melting of some of the ash content and gives little trouble. "Soft clinker" is formed by the slagging of the ash and is either pasty or fluid, and grows steadily. "Honeycomb" is formed by the condensation or coking of tarry



matter as it strikes against the fire-box sheets and results in the accumulation of a soft, light ashy substance spreading over some of the refractory or metal parts of the furnace.  $\text{FeS}_2$  reduces during combustion to  $\text{FeS}$  which is easily fusible. Incomplete combustion yields  $\text{FeO}$  which unites with  $\text{SiO}_2$  to form a honeycomb; whereas  $\text{Fe}_2\text{O}_3$  combines to form a highly infusible clinker. Increases in  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and  $\text{MgO}$  in the fuel tend to decrease, while increases in  $\text{Fe}$ ,  $\text{CaO}$ ,  $\text{K}$ , and  $\text{Na}$  tend to increase the fusibility of the ash. The handling and storage of powdered fuel, the means of filling and emptying bunkers, means of feeding burners, bunker capacities, etc., are discussed. W. H. B.

**Determination of ash of coal.** H. MASTBAUM. *Chem. Ztg.* 42, 385-6, 391-2 (1918); *J. Soc. Chem. Ind.* 37, 567 A.—Incineration in a muffle-furnace does not always give the same result in the detn. of the ash of coal as is obtained when the sample is ignited over a Bunsen burner; the latter method always gives a higher result when the coal contains much  $\text{CaCO}_3$ , since this is not decomposed completely and at the same time S compds. are absorbed from the products of combustion of the gas. If a muffle-furnace is not available, the coal should be ignited over a spirit flame or in an elec. furnace. For com. purposes, it is desirable that the method of detg. the ash of coal and the temp. employed should be prescribed. E. J. C.

**The determination of water in lignite.** G. A. BRENDER & BRANDIS. *Bruinkool* 1918, Nos. 5 and 6; *Chem. Weekblad* 16, 51 (1919).—The detn. of water in lignite as the loss in wt. on drying at  $103^\circ$  is inaccurate because at that temp. lignite gives off  $\text{CO}_2$ , even in an atm. of N, and also absorbs O from the air. The method is good enough for technical work, however, since the errors tend to compensate each other. Accurate results can be obtained by drying at  $100-5^\circ$  in a current of N (dried over  $\text{CaCl}_2$ ), absorbing the water in  $\text{CaCl}_2$  tubes and weighing. Distn. with petroleum or xylene to  $140^\circ$  (several times repeated), and catching the distillate in a buret, is also an accurate method. Dry lignite is extremely hygroscopic. JULIAN F. SMITH.

**Distillation of lignite.** G. A. BRENDER & BRANDIS. *Bruinkool* 1918, No. 12; *Chem. Weekblad* 16, 50 (1919).—Small scale distn. of lignite yielded  $\text{NH}_3$  at the rate of 3.7 kg. per ton, and 3.6% of tar which contained only small amts. of paraffin hydrocarbons. Distn. at low temp., rising slowly to  $400^\circ$ , yielded 7.5% of tar containing 13.1% of paraffins. This is lower than the usual yields from good grade lignite. Yields were calcd. on the basis of water- and ash-free lignite. JULIAN F. SMITH.

**Estimation of cyanogen compounds in concentrated ammonia liquor.** PERCY E. SPIELMANN AND HENRY WOOD. *J. Soc. Chem. Ind.* 38, 43-51 (1919).—As an improved method for the estn. of cyanogen compds. in concd.  $\text{NH}_3$  liquor from points of view of accuracy, ease and rapidity of execution, the following scheme is recommended. (1) Conversion of the  $\text{NH}_4\text{CNS}$  into  $\text{Fe}(\text{CNS})_3$  and measurement of the depth of color obtained. (2) Interaction of a further quantity of the original liquid with  $\text{NH}_3$  polysulfide, whereby the  $\text{NH}_4\text{CN}$  originally present is converted into the thiocyanate, and the estn. of the total  $\text{NH}_4\text{CNS}$  as  $\text{Fe}(\text{CNS})_3$ . The increased quantity found over and above that found directly (without polysulfide treatment) is a measure of the quantity of cyanide present. The presence of ferrocyanide compds. causes no complication, as the conversion of any proportion of ferrocyanide into thiocyanate by the polysulfide soln. can be avoided. A tintometer is used to measure depth of color. J. H. YOUNG.

**Theory of water-gas formation.** GWOSDZ. *Z. angew. Chem.* 31, I, 137-40 (1918); *J. Soc. Chem. Ind.* 37, 538A.—Expts. were made to ascertain the parts played in water-gas formation by the supposed primary reactions (1)  $\text{C} + \text{H}_2\text{O} = \text{CO} + \text{H}_2$ , and (2)  $\text{C} + 2\text{H}_2\text{O} = \text{CO}_2 + 2\text{H}_2$ , and the secondary reactions (3)  $\text{C} + \text{CO}_2 = 2\text{CO}$ , and (4)  $\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + \text{H}_2$ . Superheated steam was passed over various forms

of heated C and the compn. of the issuing gases detd. The temps. varied from 855° down to 560°, and the speed of the current of steam was also varied. Natural forms of C contg. ash in appreciable quantities behaved in a markedly different manner from purified C almost free from ash. With gas coke (8.5% ash) and wood charcoal (1.4% ash) a considerable proportion of CO<sub>2</sub> was always formed (up to 29%). On the other hand lamp C (0.1% ash) at temps. down to 600° gave mixts. closely resembling water-gas as manufd. Even at 500° the mixt.: —CO<sub>2</sub> 8.6%, CO 39.5%, H<sub>2</sub> 40.0%, residue 11.9% was obtained. It is concluded that reaction (2) cannot be a primary reaction, because reaction (3) is known to be too sluggish to account for the formation of the % of CO found at these low temps. It is also concluded that reaction (1) is the primary reaction of water-gas formation, and that the CO formed reacts with the excess of steam tending to establish the water-gas equil., and that this reaction is catalytically influenced by the finely divided ash in the C. E. J. C.

Coke and coal as fuel for gas producer. D. J. STUDLER. *Stahl u. Eisen* 38, 765-9(1918); *J. Soc. Chem. Ind.* 37, 615A.—Markgraf (*Stahl u. Eisen* 36, 1245(1916)) found that gas from a coke producer was less effective than that from a coal producer in open-hearth steel furnaces. S. has collected data on the compn. of gas from producers fired with coke and coal resp., and shows by calcs. that in general when working under similar conditions, gas from coal is more efficient in use than is that from coke, since less air is required for its combustion, and higher temps. may be attained. E. H.

Analysis of spent purifying materials from gas works. WENTZEL. *Z. angew. Chem.* 31, 176(1918); *J. Soc. Chem. Ind.* 37, 653-4A.—W. criticizes the agreement recently made between the Deutsche Gold und Silberscheideanstalt and the German gas works (*C. A.* 12, 2429). He contends that a quantity of 25 g. is far too little to afford a good av. sample for the detn. of moisture. The abs. moisture content of the material cannot be accurately detd. on account of the decompn. of the ferrocyanide, and many large gas works base their results on the air-dried material. The method proposed for the detn. of crude S is criticized on account of the large inaccuracies of the volumetric methods of measurement adopted and the high volatility of the solvent (CS<sub>2</sub>) employed. On the other hand, the Drehschmidt method is said to be satisfactory and accurate, being based on gravimetric principles; differences up to 6% of S have been found by the 2 methods and always settled in favor of the Drehschmidt method. The oxidation by fuming HNO<sub>3</sub> presents no difficulties and with 0.5 g. of substance may be completed within 4 hrs. with a consumption of not more than 30 cc. of acid. In the new method about 240 cc. of CS<sub>2</sub> is consumed per analysis, whereas in the Drehschmidt method about 50 cc. is used and immediately recovered by distn. E. J. C.

Examination of spent gas-purification masses. A. MÜLLER. *Chem. Ztg.* 42, 457(1918); *J. Soc. Chem. Ind.* 37, 690A.—The suggested conventional method of detg. S and cyanogen (Prussian blue) in the spent purification sludge from gas-works (*C. A.* 12, 2429) is open to criticism. In the detn. of the S errors may easily result during the measuring of the CS<sub>2</sub> soln., while there is no proof that extn. of the S is complete. In M.'s experience Drehschmidt's method of extn. (*J. Gasbel.* 1892, 269) is much more trustworthy and rapid. The extn. crucible is a cylindrical porcelain vessel with a perforated bottom, upon which is placed a layer of glass-wool and a compact layer of asbestos. From 15 to 20 g. of the sample is dried in this crucible at about 80° until const. in wt., the crucible then introduced into the extn. app., and the S extd. with about 70 cc. of CS<sub>2</sub>. For the detn. of Prussian blue Feld's method (*J. Gasbel.* 1904, 545) is more rapid and accurate than Knublauch's method (*J. Gasbel.* 1889, 450-9, 493-500) based on the interaction of Cu sulfate and K<sub>4</sub>Fe(CN)<sub>6</sub>; 2 g. of the spent material is triturated in a mortar with 1 cc. of FeSO<sub>4</sub> soln. (278 g. per l.) and 5 cc. of

NaOH soln. (320 g. per l.) and, after 5 mins., 30 cc. of  $MgCl_2$  soln. (610 g. per l.) is slowly stirred in, and the whole washed into a distn. flask with sufficient hot water to make up about 200 cc. After about 5 min. 100 cc. of boiling  $HgCl_2$  soln. (27.1 g. per l.) is added to the boiling liquid, and the boiling continued for about 10 mins. The flask is then connected with the distn. app., the receiver of which is charged with 20 cc. of NaOH soln. (80 g. per l.), and after the introduction of 30 cc. of dil.  $H_2SO_4$  (392 g. per l.), the liquid is distd. for about 20 to 30 mins. The distillate is made up to 250 cc., a trace of  $PbCO_3$  being added to remove any turbidity due to S, and 100 cc. is treated with 5 cc. of KI soln. (41.5 g. per l.) and titrated with 0.1 N  $AgNO_3$  soln., 1 cc. of which is equiv. to 0.009556 g. of Prussian blue,  $Fe_7(CN)_{14}$ .  
E. J. C.

**Determination of the free sulfur content of spent oxide.** N. T. TWISSELMANN. *Chem. Ztg.* 42, 588(1918); *J. Soc. Chem. Ind.* 38, 40-1A; cf. C. A. 13, 782 and preceding abstract.—Five g. of the finely powdered material is extd. for 1.5 hr. with  $CS_2$ , the solvent is then distd. from the ext., the residue of impure S dried at  $100^\circ$ , and weighed. The residue is then dissolved in  $CS_2$ , the soln. filtered, the filtrate evapd., the residue dried at  $100^\circ$ , weighed, and ground to a fine powder; 0.5 g. of this powder is ignited in a porcelain crucible until S has volatilized, and the non-volatile residue is weighed and its weight deducted from that of the impure S.  
E. J. C.

**Analysis of lignite tar from vertical retorts.** L. J. TERNEDEN. *Bruinkool* 1918, No. 4; *Chem. Weekblad* 16, 50-1(1919).—Lignite tar, distd. from vertical retorts in ordinary com. practice, was sepd. from all solids, washed with NaOH and dil.  $H_2SO_4$  and distd. It gave clear, pale yellow oils in fractions: 5.4% to  $170^\circ$ , 12.2% at  $170-230^\circ$  and 15% at  $230-70^\circ$ . The middle fraction was an excellent fuel oil. All 3 contained considerable amts. of unsatd. hydrocarbons. The tar contained 8.4% of paraffin hydrocarbons.  
JULIAN F. SMITH.

**Tar oil in Diesel engines.** H. MOORE. Diesel Engine Users' Assoc., May 26, 1918. Rep. 24 pp.; *J. Soc. Chem. Ind.* 37, 572A(1918).—Almost all heavy tar distillates are suitable for use in Diesel engines. Although the gross heat value of tar oils of British origin averages about 10.2% less than that of petroleum oils, the increase in consumption is not higher by this amt. for the reasons that tar oil generally yields a higher thermal efficiency than petroleum oil (probably due to its lower viscosity), and owing to the av. H content of tar oil being only about 6.9% as against about 11.5% for petroleum oils. The av. ignition point for tar oils is about  $480^\circ$  as against  $260^\circ$  for petroleum oils and it is this difference which is responsible for obtaining ignition of tar oils. With a normal tar oil, petroleum is necessary for starting with compression under 670 lbs. per sq. in., but good running is obtained at over  $\frac{3}{4}$  load with a compression of 460 lbs. per sq. in. Shale oil is particularly serviceable as an ignition oil with pilot ignition gear on account of its low ignition point. High temps. of the circulating water help the combustion of tar-oil to a small extent. Heating the cycle air lessens the output of the engine by rarefying the air, but aids the combustion of tar oils. Advancing the fuel valve is a distinct advantage. Mixing oils is of doubtful advantage, as it is necessary to employ more than half petroleum to obtain moderately good results. Hot blast is by far the most helpful modification for burning tar oil, but is rather dangerous, as it might cause explosions in the fuel-valve casing. The fuel-valve face suffers a little more with hot blast than in normal practice. Heating the fuel is useful from the point of view of increasing efficiency by reducing viscosity and as a means of dissolving naphthalene. Improved running on tar oil at low loads is obtained by restricting the flame plate but this is only at the expense of full load results. Wear on exhaust valve is not very serious with tar oils, but is a much more important matter when burning raw tars. It only becomes serious when firing is uncertain, and is generally much worse when running on tar oil alone than with the pilot ignition system. Oils which gave

an abrasive ash on ignition may cause trouble even when this amounts to less than 0.08%, but when the ash consists largely of  $\text{Na}_2\text{SO}_4$ , much higher ash contents are permissible. Tar oils containing pitch cause many troubles, but it is almost entirely free C which affects the use of such mixts. in Diesel Engines. J. H. YOUNG.

**Tar as fuel oil for Diesel engines.** O. SCHERTEL. *J. Gasbel.* 61, 493-5(1918); *J. Soc. Chem. Ind.* 38, 4A(1919).—Heated filtered tar has been used with complete success for 3 years as fuel for two 100-h. p. Diesel engines worked alternately. Paraffin oil, when available, was used as ignition oil but occasionally tar was used alone. Gas oils and heavy petroleum were also used to replace paraffin oil as an ignition fuel. It was then found to be advantageous to run on tar-oil for 5 or 10 min. at starting, a procedure unnecessary with paraffin oil. The calorific value of the tar was about 8700 cal., and 337 g. of tar with 20 g. of ignition oil were required to produce 1 h. p. hr. The cost of running with the usual oil would have been  $2\frac{1}{3}$  times as great. The cylinders and piston rings remained bright and clean throughout. The crude tar was run into large storage tanks where it was kept heated by hot-water pipes, and where water and solid matter sepd. It was then pumped up to a higher level into a tank holding sufficient for one day's requirements (about 500 kg.). Here also the tar was kept heated and a further sepn. of water took place. Thence the tar ran by gravity through 2 gravel filters, the grain size of the first filter being 3 to 5 mm. and in the second 1 to 2 mm., and from these through a meter and regulator to a heater where the temp. was raised to about 60°. This temp. was found necessary in order to insure complete combustion of the tar. Two pairs of filters were used alternately in periods of about 3 weeks. A steady flow of tar through the filters was obtained by fitting to the outlet of the fine filter an open vertical pipe in which the filtered tar ascended when the feed to the engine was interrupted by the regulator. The tar and the heating water were heated by means of the exhaust gases from the engine. J. H. YOUNG.

**Briquetting of coke breeze.** KAYSER. *J. Gasbel.* 61, 541-7, 556-8(1918); *J. Soc. Chem. Ind.* 38, 34-5A.—Coke breeze requires 9-10% of pitch as binding material for briquetting purposes. In the patented "Koxit" process part of the pitch is replaced by a cheaper fluid binding material consisting of oil-gas tar and vertical retort tar in about equal parts. The mixt. of coke, pitch, and liquid binding medium is heated with superheated steam and pressed into egg-shaped briquets. In a series of trials, the moisture content of the coke breeze varied from 9.3 to 19.9%. The softening point of the pitch was 83°. A very satisfactory briquet was obtained by the addition of about 5% pitch and from 0.8 to 1% of the liquid binding material. The air-dried briquets contd. 3.5-4.5% of water and yielded about 14-16% ash. The calorific value was 6400-6600 cal. The quantity of water taken up when the briquets were stored under water for 7-8 days ranged from 13 to 18.6%, as compared with 11.9% by brown coal briquets under similar conditions. The loss of wt. after transport by rail, unloading, and storing for 6 months was in 3 tests with large quantities (3200, 3250 and 7200 kg.) 4.1, 6.3, and 4.3%, resp. For preference the pitch should have a softening point between 60° and 75°. For steam-raising purposes, an addition of from 20 to 25% of coal dust is in general necessary to secure efficient combustion. The briquets do not crumble when burnt; this is due to the coking of the fluid binding material during the combustion. This coking effect is increased by the use of liquid binding materials capable of acting as solvents for the pitch, and, of such materials, vertical retort and chamber oven tars and oils, as anthracene oil, are found particularly suitable. Very viscous binding material is not suitable, as by its use air is entrapped in the pores of the coke breeze and the briquet on subsequent combustion crumbles owing to the expansion of the entrapped air. A process has been patented whereby this effect is reduced by adding the liquid binding material under reduced atm. pressure. The total

cost of manuf. including establishment charges, cost of material and labor, since the commencement of the war has amtd. to \$1.83 per ton. The sale price, detd. by the relative calorific values of the resp. fuels, is about 14 to 15% lower than that of coke.

E. J. C.

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**Four Years' Work.** An Account of the Progress of the Coal-Tar Chemical Industry during the War. Manchester: Levinstein, Ltd. 23 pp.

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Bagasse feeders, furnace design, and furnace control (GARTLEY) 28. Furnaces for the production of high temperatures (BIGOT) 1. Formation of ammonia by heating coke with calcium hydroxide (GLASER) 18. Photometer liquids in tablet form (HAUSMANN) 1. Cause of the poisonous action of coal gas on plants (WEHMER) 11D. Manufacture of sulfuric acid (CHRISP) 18. Colorado coal field of Texas (DRAKE) 8. Apparatus for the continuous testing of gases (KING) 1.

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**Ammonium sulfate.** J. BECKER. U. S. 1,291,729, Jan. 21. Ammoniacal gas from by-product ovens or gas works is passed through a cooler, condenser and tar-separator and the ammoniacal liquor thus obtained is led to an ammonia still and the  $\text{NH}_3$  from the still is led to a saturator to produce  $(\text{NH}_4)_2\text{SO}_4$ . The satn. bath is a satd. soln. of  $(\text{NH}_4)_2\text{SO}_4$  containing 5% of free  $\text{H}_2\text{SO}_4$ .  $\text{H}_2\text{SO}_4$  is added to the bath as required to replace that consumed by neutralization with  $\text{NH}_3$ . The temp. of the bath is raised by heating coils to evap.  $\text{H}_2\text{O}$  and facilitate pptn. of  $(\text{NH}_4)_2\text{SO}_4$  produced. The heat thus used is supplied by the distillate gases and vapors from the  $\text{NH}_3$  still.

**Ammonium sulfate.** J. BECKER. U. S. 1,291,730, Jan. 21. Ammoniacal liquor from by-product coke or gas ovens is freed from tar and distd. The still vapors are dephlegmated and reheated and a portion of the cooled tar-freed gas is passed into the distn. current to augment the vol. of the still vapors and derive heat with them in the distn. and reheating operation. The commingled gases and vapors thus produced and superheated are passed into the current of the other portion of the tar-freed gas to superheat the latter and the resulting superheated mixt. of gases and vapors is passed into a satn. app. to produce  $(\text{NH}_4)_2\text{SO}_4$ .

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## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

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F. M. ROGERS.

**Estimation of benzene and toluene in petroleum.** F. B. THOLE. *J. Soc. Chem. Ind.* 38, 49-43T(1919).—The procedure adopted by most chemists for the estn. of benzene and toluene in petroleum consists in preparing a petrol boiling up to about  $160^\circ$  and so containing all the benzene and toluene in the oil. This is subsequently distd. through a good fractionating column, fractions being collected between certain temp. limits and assumed to contain, resp., all the benzene, toluene, etc. These fractions are then assayed by treating with nitro-sulfuric acid, fuming  $\text{H}_2\text{SO}_4$ , liquid  $\text{SO}_2$  or  $\text{Me}_2\text{SO}_4$ , reagents which absorb the aromatic hydrocarbons by chem. action or by selective soln., and measurement of the vol. of aromatic compd. thus absorbed. Each of these operations is liable to a number of errors, is largely influenced by the personal factor, and involves assumptions of very doubtful validity. The proposed method consists in treating the prepared sample containing the benzene and toluene with 3 times its vol. of 98%  $\text{H}_2\text{SO}_4$  over a period of 30 min. during which time the sample is shaken at frequent intervals. Instead of measuring directly the vol. of the supernatant layer of unattacked hydrocarbon, as has been done, a sp. gr. detn. is made of the initial fraction

and of the residual spirit after acid treatment. Knowing the sp. gr. of the aromatic component the percentages present may be calcd. from the formula: % aromatic =  $\frac{[(\text{initial sp. gr.} - \text{final sp. gr.}) / (\text{sp. gr. of aromatic} - \text{final sp. gr.})] \times 100}{1}$ . The expression for % aromatic is based on the assumption that the sp. gr.-compn. curve for mixts. of aromatic and non-aromatic hydrocarbons is a straight line, which is not the case, the sp. gr. being slightly less than the calcd. according to the law of mixts. It is possible, however, to correct for the deviation by the construction and use of a "deviation curve." The presence of small quantities of olefins and S compds. in the petroleum has little effect on the accuracy of the method.

J. H. YOUNG.

**Testing illuminating oils.** J. F. NEWTON AND F. N. WILLIAMS. *Petroleum Age* 6, 81-84 (1919).—A description of the following tests is undertaken, gr., flash, fire, viscosity, chill, S, color, ash, burning, doctor, odor, foreign matter, calorific value and distn. The burning and S tests are most important as these det. the value of the oil both for lamps and stoves. The Saybolt colorimeter and kerosene viscometer are described and the use of the latter is shown in detail.

R. R. MATTHEWS.

**Examination of drilling oils and their substitutes.** J. MARCUSSEN. *Mitt. Kgl. Materialprüfungsamt.* 36, 107-12 (1918); *J. Soc. Chem. Ind.* 37, 725-6A (1918).—Owing to a shortage of so-called water-sol. oils used in the drilling of armor plate, Germany used a great many substitutes. Those which are free from oil include sulfite lyes, exts. of vegetable mucilage, and solns. of glue and are characterized by dissolving in water without forming an emulsion. When used as a substitute for drilling oils, the sulfite lyes require the addition of alkali as a rust-preventive. The brown specks formed on the metal when strongly alk. sulfite lyes are used are due to tannin constituents of the lyes. Sulfite lyes when treated with an excess of dil. HCl yield a ppt. of ligninsulfonic acid, which is insol. in ether or benzene, and is decompd. by strong HCl, with the liberation of SO<sub>2</sub>. They reduce Fehling soln. and solns. of dyes such as methylene blue, and give the naphthol-sulfuric acid reaction for carbohydrates. On evapn. sulfite lyes leave about 10% residue containing 10 to 15% ash, 1 to 10% S and about 0.4% N. Vegetable mucilage exts. are prepd. from seeds such as linseed, and especially from carrageen moss, which is first soaked and then boiled with water. Good preps. should give a nearly fluid jelly with 16 to 20 parts of H<sub>2</sub>O. They are characterized by the presence of vegetable particles which are rendered more distinct by staining with I. They yield a ppt. with alc. which does not dissolve readily in hot water. Fehling soln. is not reduced, unless the liquid has previously been heated with dil. acid. Glue solns. for drilling purposes are prepd. by dissolving 40 parts of glue in 50 parts of H<sub>2</sub>O and 10 parts KOH soln. (50° Bé., sp. gr. 1.53). The other group of drilling oil substitutes consists of mixts. of the above mentioned preps. with mineral oil or tar oil, as, for example, a mixt. of 80 parts of sulfite lye, 5 parts KOH soln. of the above mentioned strength, and 15 parts of tar oil or mineral oil. The methods for the analysis of these mixts. are given.

J. H. YOUNG.

**Oily constituents of acid tars from petroleum refining.** S. GASIOROWSKI AND G. VON KOZICKI. *Bergbau u. Hütte* 4, 181-2 (1918); *Z. angew. Chem.* 31, II, 354; *J. Soc. Chem. Ind.* 38, 35A.—An oil of d<sub>4</sub> 0.9685, setting pt. —19°, flash point (Martens-Pensky) 86° and viscosity (Engler) 2.2° at 20° has been obtained by steam distn. of the acid tar produced by dilg. with water the waste acid of petroleum refining. The oil was completely sol. in liquid SO<sub>2</sub>, a proof that the chief function of the H<sub>2</sub>SO<sub>4</sub> in petroleum refining is to remove unsatd. compds. Different fractions of the oil sep'd. by vacuum distn. showed no variation in sp. gr. No nitro deriv. could be prepd. from the distillate obtained by destructive distn. of the oil, showing that further unsatd. compds. are formed during the decompn.

E. J. C.

**Heat of fusion of paraffin wax.** G. VON KOZICKI AND S. VON PILAT. *Chem. Umschau* 1917, 71; *Chem. Ztg.* 42, 147(1918); *J. Soc. Chem. Ind.* 37, 681A.—The heat of fusion of paraffin wax was detd. by the lowering of the solidifying point on adding a compd. (naphthalene, dimethylaniline, phenanthraquinone) of known mol. wt. It was found that the latent heat of fusion ranges from 38.9 to 43.9, increasing with rise of sp. gr., solidifying point, and mol. wt. E. J. C.

**Scientific gages.** B. C. RINEHART. *Petroleum Age* 6, 98(1919).—An illustration of app. is shown for gaging oil tanks. It consists of a liquid level recording gage with a recording thermometer. Readings with a gage pole showing U. S. gals. should be made once a day. The app. is specially applicable to the light oils and shows a continuous record of the tank for a day or for a week depending on the recording chart used. R. R. MATTHEWS.

**Greenstreet cracking plant.** R. H. KINNEAR. *Petroleum Age* 6, 76-8(1919).—This process depends on the mixt. of live steam with oil just before the cracking coils are entered. When the conditions of speed, pressure and steam are correctly regulated there is no C formed in the coils. The cracking coils are of 2-in. tubing and have a length of 425 ft. From the cracking coils the vapors enter an expansion tank and from there pass into condensers. 50 to 60% conversion to gasoline is claimed at a manufacturing cost of 1 to 2 cents per gal., depending on local conditions. R. R. MATTHEWS.

**Valuation of natural and artificial bitumens for insulating cables by means of a new "bitumen tester."** DUPRÉ. *Chem. Ztg.* 42, 445-6(1918); *J. Soc. Chem. Ind.* 37, 645A.—Attempts were made in Germany to produce substitutes for elaterite which is used as an insulating material for elec. cables. "Insulation masses" were made by incorporating 40% or more of kaolin, chalk, etc., with natural or artificial bitumens having a dropping-point (m. p.) of about 40-60°. Such addition, however, only retards the flowing of the mass at higher temps., and cables insulated with such materials lose their shape as certainly, though not as soon, as if the unfilled bitumen were used. The improvement of ordinary bitumens, asphalts, pitches, etc., so as to raise the dropping point, while retaining their elasticity and ductility, can only be effected by a deep-seated chem. alteration of the bitumens. For example, if the mineral matter is made to combine with the bitumen as in Schon & Co.'s patent process (not yet published) the dropping point of the bitumen may be raised from 41° to 115°. J. H. YOUNG.

**Acetone.** H. P. BASSETT. *Chem. Met. Eng.* 20, 190(1919).—By heating a mixt. of lime and sawdust or wood in a similar state, a yield of 26% of acetone and higher ketones can be obtained. The mixt. should not be heated too rapidly, allowing about 10 hrs. to reach the max. temp., and removing the vapors as quickly as possible by means of steam or an inert gas such as CO<sub>2</sub>. Sulfite waste liquors also can be dried and then treated with lime to produce acetone and higher ketones. O. E. BRANSKY.

**Determination of turpentine and the detection of adulterants (TAUSZ) 26. Apparatus for the extraction of liquids in towers filled with Raschig's rings (RASCHIG) 1. Device for determining the dropping point of fats, waxes, bitumens, etc. (DUPRÉ) 1. The limits of separation by fractional distillation (DUPTRON) 1. Oilology (PETERSON) 8. Compact oil-testing cup (ANON.) 4. The testing of switch and transformer oils (SCHNEDELL) 4. Electrostatic precipitation (BRALEY) 4.**

**Horizontal pressure still for treating petroleum oils.** H. B. SETZLER. U. S. 1,292,966, Jan. 28.

**Petroleum-distillation apparatus.** G. A. HUMASON. U. S. 1,291,899, Jan. 21.

## 23. CELLULOSE AND PAPER.

A. D. LITTLE.

**The American aspen cellulose.** VICTOR LITZHAUER. *Centr. für oesterr. Papier Industrie* 23,(1918); *Paper* 23, No. 23, 646-52(1919).—A contribution to the microscopy of American aspen cellulose, together with a discussion of the com. yield of pulp from poplar pulp wood. R. B. ROE.

**Making cellulose from cotton linters.** JOSEPH H. WALLACE. *Paper* 23, No. 23, 634-42(1919).—A description of the methods of cotton purification at the Government explosive plant, Nitro, W. Va. R. B. ROE.

**Scheme for the analytical investigation of vegetable fibrous materials and the cellulose prepared from them.** C. G. SCHWALBE. *Verein deut. Chem.*, Sept., 1918; *Z. angew. Chem.* 31, 193-4(1918); *J. Soc. Chem. Ind.* 37, 685-6A.—The time is ripe for a coördinated reinvestigation on a uniform basis of all the standard raw materials of the textile and cellulose industries, in order that the proximate compn. of these can be definitely fixed, the variations due to environment, etc., defined, and the results utilized for the classification and evaluation of new or little known materials. S. discusses the question of the selection of the analytical "consts." of most general significance and of the standardization of methods and app. These questions should be settled by a committee of recognized standing, and data should be accumulated on the agreed basis. The scheme of analysis proposed by Cross and Bevan and utilized by other investigators is regarded as not fully adapted to the light of modern knowledge; it is considered to be unnecessarily long and to contain factors of undetd. significance. The abbreviated scheme recommended by S. comprizes detns. of ash, moisture, fat, wax and resin, cellulose, furfural, methylfurfural, and methoxyl. The pentosans are satisfactorily represented by the furfural value, but certain standardization of methods and app. is required to ensure concordant results. The lignin may be taken to be represented by the methoxyl value, but it is possible that this requires correction by the results found for methylfurfural which is supposed to represent methylpentosans. E. J. C.

**Tearing resistance of paper.** SIDNEY D. WELLS. *Paper* 23, No. 23, 750-3(1919).—An investigation of the tearing strength of different samples of paper was made in which the instrument used consisted of the Schopper tensile tester slightly modified for the purpose. The results obtained indicate that the tearing test furnishes valuable data from which to judge the strength of a paper. While the Schopper tensile tester may be used satisfactorily, a smaller, cheaper and better instrument for the purpose should be devised. R. B. ROE.

**Requirements of a good cooking acid.** W. E. BYRON BAKER. *Paper* 23, No. 23, 764-78(1919).—A full description of the methods of analysis of the cooking acid used in the prepn. of sulfite pulp. Various sources of error are pointed out, and there is a discussion of the methods of standardization of the volumetric solns. used. R. B. ROE.

**Alcohol from waste sulfite liquor.** VERNON K. KRIEBLE. *Paper* 23, No. 23, 753-62(1919).—An analysis of 12 representative Canadian sulfite liquors showed that the best samples contained as much sugar as European liquors and should yield at least 1% by vol. of EtOH. A description of the analytical methods used is given. The liquors examd. fall into two classes, in which 28 and 20% resp., of the org. matter is in the form of reducible sugars. The difference is not due to the relative proportions of spruce or balsam, to the strength of the cooking, nor to incomplete hydrolysis of the polysaccharides, but to the destruction of sugar in the cook. The exptl. results further showed that (1) the amt. of sugar does not reach a max.; (2) most of the sugar is produced before the end of the 7th hr.; (3) the temp. after the 7th hr. is most important;



the yield being materially reduced if the temp. exceeds  $145^{\circ}$ ; (4) the fermentable sugars are the first to be destroyed.

R. B. ROE.

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Acetone (BASSETT) 22. Making money from bagasse (BAUNARD) 28.

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**Moldable pyroxylin composition from wet pyroxylin.** W. G. LINDSAY. U. S. 1,292,819, Jan. 28. Wet pyroxylin is combined with benzyl benzoate,  $H_2O$  is removed by bibulous pads or otherwise and the mixt. thus prepd. is then suitable for working up with solvent liquids and modifying agents such as are ordinarily used with pyroxylin and camphor. The pyroxylin has a selective action in retaining the benzyl benzoate, during the removal of the  $H_2O$  by expression or absorption.

**"Carbon-paper."** S. HATTORI. U. S. 1,292,404, Jan. 21. Coating material for prepg. "carbon paper" is formed of a Ba soap mixed with oil and pigment, *e. g.*, Ba stearate 3 kg., castor oil 2.25 kg. and violet lake 3.25 kg. Soaps of Al or Mg also may be used.

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## 24. EXPLOSIVES AND EXPLOSIONS.

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C. E. MUNROE.

**Explosives.** ROBERT L. LEWIS. *Mining Sci. Press* 118, 245-53(1919).—A condensed, well illustrated, description of commonly known explosives. The trade names of different dynamites do not truly represent their comparative strengths. A 60% straight dynamite and a 60% low-freezing dynamite will not have the same strength. The potential energy of 40% ammonia dynamite and 40% gelatin dynamite is greater than that of 40% straight dynamite, but the useful work that can be done, represented by the propulsive and disruptive effects, is less. The strength of 60% low-freezing dynamite is not quite equal to that of 40% straight dynamite. CHARLES E. MUNROE.

**Report Chief Bureau of Ordnance, U. S. N. for 1918.** RALPH EARLE.—An account is given of the ammunition on the J. L. Luckerback, which was thoroughly wet by the flooding of her magazines when a fire broke out on the ship and which functioned satisfactorily in the subsequent engagement of this vessel with a German submarine, 202 rounds being fired. Some two pages are devoted to accidents in manuf. in this country, with the exception of a review of the Halifax disaster, following a collision of the Mont Blanc with the Imo, wherein it is stated "The former's benzine tanks were soon ruptured and the benzine caught fire from the boilers, the ship being soon enveloped in flames. The explosives detonated in 17 minutes after the fire started, a time all experiments indicate as necessary to detonate T. N. T., 'D,' or picric acid after a fire is kindled about it." Cf. C. A. 12, 426.

CHARLES E. MUNROE.

**Costs and efficiencies for Government explosives factories.** K. B. QUINAN. *Chem. Trade J.* 64, 115-7, 139, 161-2(1919).—This is an extended résumé of two reports of the British Ministry of Munitions, Dept. of Explosives Supply, giving detailed data for the operations, during January-June 1918, attending the manuf. of T. N. T., nitrocellulose, nitroglycerin, cordite, picric acid, tetryl,  $NH_4NO_3$ ,  $NH_4ClO_4$ ,  $Ca(NO_3)_2 \cdot 4H_2O$ ,  $Et_2O$ ,  $HNO_3$ ,  $SO_3$ , and the denitration, distn. and concn. of spent acids. In the majority of instances the data for a topic are presented in tabular form, showing for each factory producing this material, the total product, the efficiency, the quantity and cost of each of the materials used, the cost of "services," (including maintenance, labor and general expenses), and the cost per unit of the product. In the case of T. N. T. 6 factories are thus compared with one another; in the case of  $HNO_3$ , 9 factories;  $SO_3$ , 8; denitration, 10; concn 12; and a fewer number in the other tables. In these

tables are compared the results from different methods of operation as in the  $\text{SO}_2$  table giving those from the Grillo, Mannheim and Tentelew processes; in the concn. table, giving those from the Cascade, Gaillard and Kessler systems; in the  $\text{NH}_4\text{NO}_3$  table, giving those from the ammonia-soda process, the  $\text{Ca}(\text{NO}_3)_2$  conversion process, the  $\text{NaNO}_3$  conversion process; and so on. The system of gathering the statistics from which these are taken was introduced as a means of controlling the operations of the many new factories which were erected and operated to meet the extraordinary demands of war and which were necessarily entrusted largely to inexperienced staffs and personnel. Each of the tables is explained and analyzed and though in instances the av. cost of maintenance steadily increased the general improvement shown justifies the use of this system of control.

CHARLES E. MUNROE.

**Report Chief Inspector Bureau of Explosives A. R. A. for 1918.** COL. B. W. DUNN. B. E. *Rept.* No. 12, Feb. 1919.—Our military program, adopted early in 1918, called for a production in one year of about two billion lbs. of explosives for military use, and for the production of poisonous liquids and gases at a max. rate of about 200 tons per day. The actual production attained under this program cannot be stated at this time, but it is known that for most of the year preceding the signing of the armistice, the monthly production of military explosives exceeded eighty million lbs., or more than 2000 carloads of 40,000 pounds each per day. These explosives moved to the loading plants where each carload of explosives produced not less than 5 carloads of explosive projectiles. A conservative estimate shows that the railroads of the U. S. during the busy months of 1918, had at all times not less than 50,000 cars in transit on Government business and bearing the explosive placard. This was in addition to the av. of 5000 cars in transit to meet the normal commercial demand, and does not include the cars bearing military explosives to Canada. In meeting this abnormal demand only 11 accidents of all kinds occurred in the transportation of explosives during 1918, only four persons were injured, and only 1 life was lost; and the total property loss was only \$33,238. Of these results the only one chargeable to war material was the loss of one life, which occurred in Canada. This excellent record is due, primarily, to the general use of standard packages and of standard methods in loading, blocking and bracing the packages in cars. Such standardization is secured more readily for explosives than for many of the other classes of dangerous articles on account of the relatively small number of shippers of explosives, and their very general appreciation of the necessity for strict compliance with the regulations. The report is accompanied by seven appendices: (1) containing statistical tables covering reported explosions, fires, and accidents in the transportation or storage on railway property awaiting delivery of explosives and other dangerous articles; (2) report from the Chemical Laboratory; (3) recommendations for the proper handling of wrecks involving tank cars of inflammable oils; (4) instructions for packing  $\text{HNO}_3$  for transportation; with methods for testing carboys; and (6) containing detailed descriptions of the more important instances of accidents. Cf. C. A. 12, 2441.

CHARLES E. MUNROE.

**The construction of graphs for calculating the revivification of spent acids.** R. A. FOWLER. *J. Soc. Chem. Ind.* 38, 34-67(1919).—In order to lessen the work of calcg. the amts. of fortifying and sulfuric acids to be added to a spent acid to give a mixed acid of desired compn. F. has devised a graphical chart from which these figures can be readily detd. Details are given both as to the construction of the chart and as to the mathematical calcns. involved in its detn. It is claimed that results can be obtained from the graph to within 0.02% in the nitrating acid.

ISMAR GINSBERG.

**Solvents for nitrocellulose.** ANDRÉ DUBOSC. *Caoutchouc & gutta-percha* 16, 9716(1919).—A practically complete list.

JOHN B. TUTTLE.

**Rupture of cast iron in contact with mixed acid.** A. C. CUMMING. *J. Soc. Chem.*

*Ind.* 38, 31-27(1919).—This article is a very interesting report on an explosion of two cast-iron eggs, in the course of blowing T. N. T. mixed acid, under a pressure of 60 lbs. per sq. in. Examn. of fragments of the eggs showed very slight corrosion of the metal. Photomicrographs indicated that the acid had penetrated the metal to  $\frac{1}{2}$  of its thickness ( $1''$  to  $1\frac{1}{2}''$ ) and had formed small clusters of Fe salt crystals. The explosion is attributed to the expansive force caused by the growth of these crystals. Reference is made to similar failures of cast-iron app. used with oleum, which in this case are due to the generation of gases within the iron walls, caused by the decompn. of the  $H_2SO_4$  by the reducing action of the Fe. It is advised that no cast iron be used in the construction of app. coming in contact with oleum or  $HNO_3$ , whether pressure is employed or not.

ISMAR GINSBERG.

Making cellulose from cotton linters (WALLACE) 23.  $\alpha$ -,  $\beta$ -, and  $\gamma$ -Trinitrotoluene (RYAN, O'RIORDAN) 10. Action of nitric acid and nitrous acid on diphenylamine (RYAN, RYAN) 10.

GIUA, MICHELE: *Chimica delle Sostanze Esplosive*. Milan: Ulrico Hoepli. 556 pp. L 28.

Reports I and II on Costs and Efficiencies for H. M. Factories Controlled by Factories Branch, Department of Explosives Supply. H. M. Stationery Office. 79 and 134 pp.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Microscopical analysis of textiles. F. PUGH. *Can. Chem. J.* 3, 84-6(1919).—An interesting popular address which gives descriptions of the microscopical appearances of various animal and vegetable fibers used for textiles.

L. W. RIGGS.

Making wool-like fibers from bast. PLANTE FEBURE. *Ind. Merc.* 41, 163-4 (1918); *Chem. Weekblad* 16, 80-1(1919).—Bast fibers can be bleached and made fine and woolly in 1 process by treating with an oxidizing agent in a strongly alk. bath, usually at room temp. Sometimes it is better to warm to  $40^\circ$ . Sometimes a second treatment in the same bath, with addition of soap or Turkey-red oil, is necessary to obtain the desired softness. Mixed with wool, the fabrics woven from this material show no difference in appearance or feel from pure wool fabrics. Dyeing causes no ill effects.

JULIAN F. SMITH.

Some problems relating to the scouring process. S. A. SHORTER. *J. Soc. Dyers Colourists* 35, 55-8(1919); cf. *C. A.* 12, 2447.—Three problems are considered: (1) best concn. of soap in scouring; (2) best concn. of alkali and (3) why a soap bath becomes exhausted. (1) Soap acts as a detergent because it lowers enormously the tension of the interface between water and grease, thus assisting in wetting out, and because as a colloid it exerts a stabilizing effect upon emulsions and suspensions. A curve showing the relation between "drop-number" and the concns. of soap soln. indicates that so far as surface tension is concerned it is a waste of soap to use it at a concn. much greater than 0.4%. Expts. on the effect of a soap on the stability of fine suspensions have shown that there is a max. effect at concn. from 0.2 to 0.3%, and from a study of both effects it is concluded that 0.46 represents the max. concn. at which it is desirable to use soap for scouring. The presence of alkali increases enormously the surface tension; the alkali, if its concn. exceeds a comparatively small amt., tends to diminish the stabilizing effect so that in actual practice one must compromise with these two effects. This usually results in sacrifice of stabilizing effect for the sake of effecting rapid initial emulsification.

(2) When pieces are scoured with alkali alone the emulsification is due to the formation, in the surface layers sepg. the soln. and the oil on the piece, of a layer of soap by the interaction of the alkali and the free fatty acid in the oil. The stabilization of the emulsion is due to the passing into soln. of the soap thus formed. Surface tension effect of alkali against an oil containing free fatty acid is exhibited by extremely weak solns. of alkali. Such weak solns. have no stabilizing power. Alkali must be sufficient to form a soap soln., that is strong enough, but if too concd., a soap soln. cannot be formed, and the emulsion droplets are coagulated. This coagulating effect seems to occur between concns. of 1 and 2%. In scouring with alkali alone it is better to avoid high concns. in the initial stages, *i. e.*, until enough soap has been formed and dissolved to produce the necessary stabilizing effect. (3) Exhaustion of a soap soln. may be due to 2 causes (a) removal of soap from soln.; (b) excess of dirt and grease in soln. The emulsion droplets are coated with a soap layer and if the droplets are sufficiently fine an appreciable amt. of soap may be removed in this way. In case of wool scouring liquors, the main cause of their ceasing to scour is their fouling with dirt and grease.

L. A. OLNEY.

**Sizing.** R. H. PICKARD. *J. Text. Inst.* 10, 54-5(1919); cf. *C. A.* 12, 1125, 1514.—But little accurate work has been done upon the subject of sizing of textiles, partly because the relative cost of the size to the cost of the cloth was small, and partly because many people fancied they possessed valuable secrets with reference to the details of the process. Generally the substances used were chosen because of the feel imparted to the cloth. The feel depends upon the starches and the softeners (fats) employed. The production of fats of almost any degree of hardness or of m.p. has opened a wide field to the size mixer as it is possible to produce cloth of any desired feel by varying the fat used. Sizing should also be studied with reference to the behavior of the warp under the strain of weaving, the effect on strength and elasticity being considered as well as pliability. At present too much is left to judgment. The coöperation of "practical and scientific" men is urged.

L. W. RIGGS.

**Silk weighting with zirconium sulfate.** E. RISTENPART. *Färber-Ztg.* 29, 26 (1918); *J. Soc. Chem. Ind.* 37, 687A.—Expts. show that the weighting of silk by Zr sulfate cannot replace the weighting by Sn salts.

E. J. C.

**Differentiation of natural and artificial silks.** A. HERZOG. *Kunststoffe* 7, 277-8 (1917); *Z. angew. Chem.* 31, II, 225(1918); *J. Soc. Chem. Ind.* 37, 574A.—A physical method of differentiation is described which is based on the differences between the refractive indices and which is applicable in the case of dyed fibers. A fiber of natural silk mounted in aniline and examd. under a microscope with a Nicol prism is almost invisible when its longitudinal axis is at right angles to the plane of polarization of the prism, and becomes more and more visible when the stage is rotated, until it reaches a max. of visibility at right angles to the original position. Artificial silk fibers have a  $n$  considerably below that of aniline and are distinctly visible at all positions of the revolving stage.

E. J. C.

**Oxygen tendering of laundry (textile) goods.** P. HEERMANN. *Chem. Ztg.* 42, 337-8, 342-3(1918); *J. Soc. Chem. Ind.* 37, 576A.—H. replies to various objections which have been raised against his previous work (*C. A.* 12, 1254) and brings forward evidence to show that washing powders contg. available O or bleaching agents are more injurious to fabrics than are those free from these substances. In practice, it is quite possible to have conditions under which the bleaching powders will produce local destruction and perforation of fabrics.

E. H.

**Analysis and inspection of impermeable fabrics.** *Ind. chim. min. met.* 6, 14-5 (1919); *Ind. tessile e tintoria* 19, 54.—The following physical tests are of value: pre-

liminary examn. of the cloth to detect visible imperfections; detn. of time required for water under slight pressure to pass through; detn. of resistance to molds by inoculation with spores and incubation for several days; effects of changes of temp. between  $0^{\circ}$  and  $100^{\circ}$  and of action of light, especially ultraviolet. The impregnating material may be removed by soln., hydrolysis, etc., and its amt. and nature detd. by chem. tests. If any sterilizing substance has been used it should be examd. similarly.

J. S. LAIRD.

**Determination of loss of oxygen during the use of oxygen-yielding bleaching and washing materials.** A. GRÜN AND J. JUNGSMANN. *Chem. Ztg.* 42, 473-5 (1918); *J. Soc. Chem. Ind.* 37, 729A.—The method described consists in heating a known wt. of fabric with a definite quantity of the bleaching agent in a flask under reduced pressure. The flask is connected through a condenser with a gas buret, in which any gases given off during the heating are collected. Subsequent analysis of the gases given the quantity of O evolved from the bleaching agent and not combined with the fabric, etc. The quantity of N found in the gases is taken as a measure of the air present in the app. and an allowance is made for the O derived from this source. Results of expts. with perborates show that from 60 to 80% of the active O escapes in the gaseous form, but if soap is also present the loss is under 12%. The greater part of the active O is absorbed by the oxidizable constituents of the soap.

E. J. C.

**Dyeing of cotton fiber with basic dyes.** R. HALLER. *Kolloid-Z.* 23, 100-6 (1918); *J. Soc. Chem. Ind.* 37, 729A.—The mechanism of dyeing cotton with basic dyes is shown to be the following in the case of methylene blue. On immersing the fabric in a tannin soln., this by virtue of its highly disperse state penetrates into the interstices, and when the tannin-charged fabric is placed in a soln. of tartar emetic this substance as a mol. disperse soln. penetrates very rapidly and forms in the interstices an insol. Sb-tannin compd. When now the fabric is placed in the methylene blue bath this substance, being also highly disperse, penetrates and forms a complex lake, tannin-Sb-methylene blue, which is fixed in the fiber. A similar course is followed when  $Al_2(SO_4)_3$  is used instead of tartar emetic, but in this case the tannin-Al compd. is sol. and consequently the colors are not so fast as in the former case.

E. J. C.

**Mordant dyes in calico printing.** H. POMERANZ. *Monatsschr. Text.-Ind.* 33, 30-1, 38, 45-6 (1918); *Z. angew. Chem.* 31, II, 350; *J. Soc. Chem. Ind.* 38, 39A.—The manner is discussed of the fixation of acid mordant dyes in calico-printing, particularly of alizarin. The formation of the color-lake on the fiber under the action of steaming is the result of a mutual reaction between the fiber, mordant, and dye, leading to the production of a colloidal coloring matter, which in itself has the property of dyeing the fiber but which does so still better through the part played in its formation by the colloidal alumina deposited in the fiber. According to Liebermann's expts. (cf. *C.* A. 2, 2811) no stoichiometrical relations exist between dye and mordant. The oil exists both as a constituent of the color-lake and in a peculiar form of direct combination with the cotton. Before the appearance of Turkey-red oil, P. employed oil in the printing color for goods not prepd. with oil. He used ricinoleic acid emulsified with saponin and the color was thickened with starch and gum, the starch being gelatinized by heating together with the oil and gum. The portion of the oil mordant intended to enter into combination with the color-lake was added to the printing color in the form of Ca ricinoleate.

E. J. C.

Scheme for the analytical investigation of vegetable fibrous materials, etc. (SCHWALBE) 23. Recovery of volatile inflammable solvents in industrial operations (SESTINI) 18. Making cellulose from cotton linters (WALLACE) 23.

**Notes on Flax.** I. The Cultivation of Flax in Great Britain. II. The Separation of Vegetable Fibers. III. Linseed as a Farm Crop in Great Britain. IV. The Cultivation of Flax for Fibre in Great Britain. V. The Cultivation of Flax for Seed in Great Britain. VI. Oil from British-grown Linseed. VII. The Isolation of Improved Strains of Flax Seed for Sowing Purposes. London: British Flax and Hemp Growers' Society, Ltd. 14 Victoria St., S. W. 1.

**Statistics of Synthetic Dyestuffs Imported into the United Kingdom during the Year 1913.** Report of the Commissioner for Dyes, Board of Trade. H. M. Stationery Office. 168 pp.

**Copper compounds of *o*-hydroxyazo dyes.** E. ANDERWERT, H. FRITZSCHE and H. SCHOBEL. U. S. 1,292,385, Jan. 21. Cu compds. are formed of azo dyes derived from *o*-NH<sub>2</sub> compds. as one component, *e. g.*, dyes from *o*-NH<sub>2</sub>C<sub>6</sub>H<sub>4</sub>OH, 2,4-NH<sub>2</sub>(NO<sub>2</sub>)<sub>2</sub>-C<sub>6</sub>H<sub>3</sub>OH, or chloronitroaminophenols, coupled with naphtholsulfonic acid derivs. (forming either mono- or poly-azo dyes), by reacting on the dye in acid soln. with CuSO<sub>4</sub>. The Cu compds. dye like the other substantive dyestuffs from their aq. solns. and yield colors which are more fast to washing and especially to alkalis and acids than the original dyes uncombined with Cu. The fastness to light is also improved by conversion of the dyes into Cu compds. The pat. gives many examples of dyes prepd. by this method.

**Fixing dyes on fabrics.** A. A. GEHRLEIN. U. S. 1,292,453, Jan. 28. NaHSO<sub>3</sub> is used as a fixing agent on fabrics which have been previously treated with a dye. A faster and brighter color may be obtained than by the use of alum.

**Artificial threads from viscose.** G. WALTHER. U. S. 1,292,544, Jan. 28. Pptg. baths for the manuf. of threads from viscose are prepd. with aldehyde-bisulfites or aldehyde sulfoxalates. Pptg. solns. may be formed of glucose 300 and 35-36° Bé. NaHSO<sub>3</sub> soln. 1000 parts; or 40% CH<sub>2</sub>O soln. 300 and 36° Bé. NaHSO<sub>3</sub> soln. 1000 parts; or acetone 186 and 36° Bé. NaHSO<sub>3</sub> soln. 1000 parts; or benzaldehyde 377 and 36° Bé. NaHSO<sub>3</sub> soln. 1000 parts or "rongalite" 400 and H<sub>2</sub>O 1000 parts; or phenol 94, Na<sub>2</sub>SO<sub>3</sub> 250, 40% CH<sub>2</sub>O soln. 76 and H<sub>2</sub>O 500 parts. These solns. are heated to about 50-60° during spinning and are adapted for use with viscose in various stages of the maturing operation. Na<sub>2</sub>SO<sub>4</sub> or NaOAc or sugars may be added to the baths. The baths remain clear during use so that irregularities in the spinning can be readily observed.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

**The analysis of red lead.** W. F. EDWARDS. *Chem. Met. Eng.* 20, 260(1919).—Compares the H<sub>2</sub>O<sub>2</sub>-KMnO<sub>4</sub> method for Pb<sub>2</sub>O<sub>3</sub> given in C. A. 10, 1019 with his I method (C. A. 13, 382). Hot water or diln. is not required and a regular 0.1 N KMnO<sub>4</sub> soln. with a factor of 0.03428 for Pb<sub>2</sub>O<sub>3</sub> is used. Results are given of samples run by the two methods, and although the results by the H<sub>2</sub>O<sub>2</sub> method are slightly lower, both methods check very closely.

J. E. CLARK.

**Safflower oil as a drying oil.** HAROLD H. MANN AND N. V. KANITKAR. *J. Soc. Chem. Ind.* 38, 36-38 T(1919).—Safflower seed grows in the driest areas of Deccan in western India, and contains an av. of 32% oil in the whole seed or 52% in the kernel. The oil is used almost exclusively for edible purposes. Analyses on 4 different samples showed *d*<sub>4</sub> 0.914; sapon. no. 177 to 203; acid no. 0.6 to 2.6; I no. 111 to 122; butyrefractometer at 40°, 63 to 64°. Satd. fatty acids consist mostly of palmitic acid. In order to test the statement of Lewkowitsch that the thickening of the oil on heating is due primarily to polymerization instead of to oxidation, the oils were heated for vary-

ing lengths of time at 100°, at 180°, and at 300° in O and in CO<sub>2</sub>. Consts. of the oils were then detd. every few hrs., and the tabulated results show that changes due to heating are largely of the nature of decompn. with some polymerization and only to a minor extent oxidation. When mixed with PbO and exposed in thin layers, the original oil showed 8.2% max. gain in wt. Raw safflower oil mixed with Mn borate dried in 66 hrs. Oil heated to 100° and especially that heated to 186° in O, showed a marked reduction in drying time, while heating to 300° retarded drying. White lead paints made with safflower oil were compared with paints made with boiled linseed oil. While heating the oil at the lower temps. decreased the drying time of the oil alone, it increased the drying time of the white paint. The paints gave a far more glossy and an equally hard coat, as the paints made with the boiled linseed oil. All exptl. results are tabulated.

F. A. WERTZ.

**History and manufacture of floor-cloth and linoleum.** M. W. JONES. *J. Soc. Chem. Ind.* 38, 26-31T(1919).—Historical review.

F. A. WERTZ.

**Determination of turpentine and the detection of adulterants.** J. TAUSZ. *Chem. Ztg.* 42, 349-51(1918); *J. Soc. Chem. Ind.* 37, 554A.—Turpentine and other unsatd. hydrocarbons combine with Hg(OAc)<sub>2</sub>, or are oxidized by it; one mol. of AcOH is set free for each mol. of terpene, etc., present and a detn. of this acidity gives a measure of the turpentine present. Ten cc. of pure turpentine and 10 cc. of the sample under examn. are each dild. with MeOH to 100 cc. (the reaction proceeds more quickly in the presence of MeOH) and 10 cc. of each of these solns. is mixed with 50 cc. of satd. HgCl<sub>2</sub> soln. (in MeOH) and 50 cc. of 0.1 N KOH soln. (also prepd. with MeOH). The mixts. are dild. with 100 cc. of water, shaken, kept in the dark for 1 hr., phenolphthalein is added, and NaCl soln. is run in until a red coloration develops; the mixts. are then titrated with 0.1 N H<sub>2</sub>SO<sub>4</sub>. A control test, without turpentine, is made at the same time. Usually, turpentine substitutes do not react with Hg(OAc)<sub>2</sub>; rosin spirit yields a small quantity of free AcOH, and if this adulterant is present, turpentine contg. approx. the same quantity as the sample should be used for the comparison titration. When pure turpentine is heated under a reflux condenser for 3 hrs. with Hg(OAc)<sub>2</sub> soln. and MeOH, and then steam-distd., no trace of oil is found in the distillate. Hydrocarbons, however, such as mesitylene, cumene, cymene, petroleum spirit, etc., pass almost quantitatively into the distillate and their quantity may be measured. The loss is about 0.2 cc. for each 10 cc. of hydrocarbon, but it varies with each app. and should be detd. separately. This method permits further examn. of the distd. adulterant. The reaction between turpentine and mercuric acetate may also be used gravimetrically. Five cc. of the sample is dild. to 100 cc. with MeOH and 5 cc. of this soln. is mixed with 50 cc. of satd. aq. mercuric acetate soln. and heated for 4 hrs. in a closed flask in a boiling water bath; after cooling, the HgOAc formed is collected, washed with alc. and ether, dried, dissolved in HNO<sub>3</sub> (1:1), the soln. treated with NaCl, and the HgCl collected and weighed. A control test is made at the same time, using pure turpentine; the quantity of turpentine in the sample is proportional to the amt. of HgCl found.

E. J. C.

**ANDES, LOUIS E.: Oil Colors and Printers' Inks.** Translated from the German. 2nd Ed. Revized and enlarged by H. B. Stocks. New York: D. Van Nostrand Co. 235 pp. \$4.

**Zinc oxide pigment.** L. E. WEMPLE. U. S. 1,292,976, Jan. 28. In prepg. a pigment, a crude ZnO which has an excess of ZnSO<sub>4</sub> and in which the Pb and Cd is present as sulfate is heated with C to a temp. of 480-650° to effect a selective action upon the ZnSO<sub>4</sub> without reduction of the Pb or Cd sulfates.

**Paints and varnishes containing coumarone resin.** F. W. SPERR, JR. and M. DARRIN. U. S. 1,292,907, Jan. 28. Coumarone resin used with coal-tar pitch in forming paints and varnishes serves to prevent deposition of the free C from the pitch on standing. Other constituents such as turpentine oil, linseed or China wood oil, Venetian red, red lead, Zn oleate, Mg resinate or BaSO<sub>4</sub> may be used in the mixts. Solvents containing coumarone or indene may be mixed with the pitch and the coumarone or indene then polymerized by heating to 160° and blowing air into the mixt.

**Paints and varnishes containing coumarone or indene resins** F. W. SPERR, JR. and M. DARRIN. U. S. 1,292,908, Jan. 28. This pat. relates to the prepn. of mixts. similar to those of the preceding pat. *E. g.*, a paint may be formed of 700 lbs. medium grade water-gas-tar pitch and 55 gals. solvent naphtha containing about 40% coumarone-indene substances.

**Drier for oils, paints and varnishes.** A. SCHWARCMAN. U. S. 1,291,185, Jan. 14. Raw or refined linseed oil 1000 parts is mixed with 50 parts of MnO<sub>2</sub>, 50 parts of PbO and 500 parts H<sub>2</sub>O. The mixt. is thoroughly churned and heated in an autoclave to a temp. of 125–160° under a pressure of 150–175 lbs. per sq. in. for 2–3 hrs. This effects a splitting of the oil and combining with Pb and Mn of part of the fatty acids liberated. The glycerol is sepd. and the fatty acid salts constitute a light-colored drier.

**Drier for linseed oil or similar oils.** A. SCHWARCMAN. U. S. 1,291,186, Jan. 14. Linseed oil or similar fatty oil is split into free fatty acids and glycerol by the Twitchell process or any other suitable method and the fatty acids are then converted into Mn or Pb salts by successive addition to them of MnCl<sub>2</sub> or Pb(OAc)<sub>2</sub> and a combining proportion of caustic alkali and heating to 115°. Large quantities of drier can be made in a single operation by this process and when about 2% of the drier is added to raw linseed oil a paint oil is obtained having the natural color of the raw oil and unchanged viscosity which may be used for the ordinary purposes of so-called commercial "boiled oil." About 0.3–1% of the metallic salts also may be combined with raw linseed oil to give it the drying properties of boiled oil without impairing its original color.

**Coating webs.** E. HAEFELY & CIE. Brit. 121,742, Dec. 19, 1918. Paper or other fibrous fabric is coated with an adhesive material for insulating purposes by applying a fusible, natural or artificial varnish or gum in powdered or solid form in a continuous operation, and then passing the fabric over a hot roller or plate or through a heated space to melt and fix the adhesive.

**Linoleum.** A. B. CRAVEN and YORKSHIRE DYEWARE & CHEM. Co. Brit. 121,777, Dec. 20, 1917. A linoleum cement is obtained by distg. either the fatty acids from drying and semi-drying oils, or the oils themselves (except tung oil), or mixts. or these substances, or by-products obtained in refining these oils, until the requisite resilient, tacky, and adhesive residue is obtained. The distn. may be effected with or without the use of superheated steam, CO<sub>2</sub>, or other inert gas, or vacuum. The distillate consists of non-polymerizable fatty acids with or without glycerol. The by-products employed are those obtained in refining oils by means of acid, alkali, or dichromate and acid, or by sedimentation, or the oily substances recovered from fuller's earth. The products are improved by bleaching the raw materials before distn. as by treatment with bleaching powder and acid, or with strong alkali. The raw materials may also be filtered in a filter press to remove solid fatty matters and impurities. An increased yield is obtained by preliminarily polymerizing the raw materials by means of heat. Gum resins, resin, etc., may be added during or after the distn. In the preferred procedure, the raw materials after a preliminary purification are heated to 270–300° for 30 min. to polymerize them, and are then distd. by means of superheated steam at temps. gradually rising from 200 to 300°, the operation taking 10–24 hr. The pre-



liminary treatment of foots may comprize washing with strong alkali and acid. Crude cottonseed oil is washed with strong NaOH. Linseed oil fatty acids are filter-pressed. The treatments of linseed oil and of soy oil is described.

**Distilling crude pine-resins.** R. DUNWODY. U. S. 1,291,800, Jan. 21. Turpentine and rosin are obtained from crude gum by passing it through strainers of different mesh, distg. the unstrained portion of the gum to sep. out rosin and passing the vapors of the distillate through the strainers to dissolve any gum present on them. The dissolved gum thus obtained is added to the strained portions originally obtained.

**Resin size.** J. A. DECREW. U. S. 1,292,721, Jan. 28. Resin size is prepd. by heating resin soap in a closed vessel, forcing it through a screen by pressure from the interior of the vessel and forcing hot  $H_2O$  against the soap as it issues through the screen.

## 27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

**Saponifiable fat and total fat.** J. PRESCHER. *Z. Nahr. Genussm.* 36, 71-3 (1918); *J. Soc. Chem. Ind.* 37, 741A.—The true fat content of a material (fatty acid plus neutral fat) is best ascertained from detns. of the free fatty acids, the total fatty acids, and the sapon. value.

E. J. C.

**Determination of the oil content of oil seeds.** R. BIAZZO. Napoli. *Ann. chim. Applicata* 10, 130-3 (1918).—Com. quotations of oil seeds are based upon oil content, upon the source, age, degree of development, purity and state of preservation of the seeds themselves. Ordinarily the oil content is made by extrn. in one or another form of Soxhlet extractor. The method of extrn. is described in detail.

ROBERT S. POSMONTIER.

**Fish oils.** W. FAHRION. *Chem. Umschau* 1917, 57; *Chem. Ztg.* 42, 136 (1918); *J. Soc. Chem. Ind.* 37, 630A.—The statement by F., made nearly 25 years ago (*Chem. Ztg.* 17, 521-4 (1893)), that fish oils contd. jecoric acid,  $C_{18}H_{30}O_2$ , an isomer of linolenic acid, has been confirmed by the examn. of sardine oil. Besides the more unsatd. acid, clupanodonic acid,  $C_{18}H_{28}O_2$ , discovered by Tsujimoto (*J. Coll. Eng. Univ. Tokyo* 4, 1-9 (1906)), this oil contains jecoric acid and probably also a less unsatd. fatty acid. The occurrence in natural fats of fatty acids contg. an odd number of C atoms is still open to doubt, but later investigations make it appear possible that asellenic acid,  $C_{17}H_{32}O_2$ , isolated from liver oils, is an individual acid and not a mixt. of stearic and palmitic acids.

E. J. C.

**Utilization of plum stones for oil in Germany.** K. ALPERS. *Pharm. Ztg.* 63, 354; *Pharm. J.* 101, 151 (1918).—Examn. of the stones of plums, cherries, peaches and apricots gave the following results: Air-dry stones in plums 4.1%; cherries 7.7; kernels in plum stones 12.6%, in cherry stones 22.9, in peach stones 5.7, in apricot stones 29.2%. Oil in plum kernels 37.38%, proteins 23.78%; in cherry kernels 38.71 and 28.01; in peach kernels 45.45 and 26.01; in apricot kernels 51.43 and 28.36%. Yield of oil from plum stones 3 to 4.3%; from cherry stones 4%. Germany possesses 21 million cherry trees and 69 million plum trees, the utilization of the stones should therefore pay well. The stones can be cracked in a mill and the kernels sepd. by a soln. of  $MgCl_2$  or other salt of sp. gr. of about 1.15, in which the kernels float. Plum kernel oil will keep for years; cherry kernel oil becomes slightly rancid.

S. WALDBOTT.

**The manufacture of neutral palm oil.** LINDER AND DYBOWSKI. *Compt. rend. acad. agr.* 5, 158-9 (1919).—Announcement and discussion of work by Paul Ammann. The bunches of fruit should be detached before full maturity and immediately cooked in

H<sub>2</sub>O. Oils are thus obtained of an acidity not exceeding 0.2% instead of the 14 to 15% frequently met with.

ALBERT R. MERZ.

Experiments in preparing copra. M. B. SMITHS. *Teysmannia* 29, 128-31(1918); *Chem. Weekblad* 16, 82-3(1919).—Careful cultivation and fertilization of the trees greatly improved the quality of the coconuts and the oil yield from the copra.

JULIAN F. SMITH.

Direct determination of calcium soaps by means of solvents. E. SALM AND S. PRAGER. *Chem. Ztg.* 42, 463-4(1918); *J. Soc. Chem. Ind.* 37, 707A.—Ca soaps prepd. from bone-fat, glue-leather fat, neat's-foot oil, linseed oil, and castor oil were extd. for 16 hrs. with various solvents, and the amts. of ext. detd. In each case the soap swelled up into a gelatinous mass when heated with petroleum spirit, CS<sub>2</sub>, benzene, or CCl<sub>4</sub>, but not with AcOH or ether, so that concordant results were obtained with the latter solvents. With the exception of castor oil Ca soap (soly. 92.2%) all the soaps dissolved with difficulty in acetone. Ether had a greater solvent action than acetone, especially in the case of the neat's-foot oil and linseed oil soaps. Hence acetone should be used rather than ether for sepg. neutral fats from Ca soaps. The Ca salts of bone-fat and glue-leather fat are readily sol. in benzene and CCl<sub>4</sub>, and one of these solvents should be used instead of ether or acetone for extg. the total fat, including Ca soaps, from fatty material contg. such soaps, provided that the material does not swell up in the treatment. The soly. of Ca soaps in benzene increases with the temp., and is complete at the b. p. of the solvent after extn. during about 6 hrs. in a Besson flask. Moisture reduces the soly. so that the material should first be dried at 95 to 100°. The results thus obtained agree closely with those given by Fahrion's method (*Chem. Ztg.* 23, 452).

E. J. C.

Further note on the analysis of soap. R. LÉCOQ. Paris. *Bull. sci. pharmaco.* 25, 355-357(1918).—The detn. of total fatty acids in toilet soaps when the fats have been obtained from the wastage in the manuf. of common soap presents difficulties which are compensated for by the following procedure: Five g. of finely pulverized soap are dissolved over a boiling water-bath in a sufficient amt. of distd. water contained in a cylindrical flask of Bohemian glass. The fatty acids freed by an excess of HCl collect in a liquid layer which solidifies on cooling. The mass of this cake obtained after decantation of the underlying liquid is dried in an oven at 100-110° in a tared crystallizing dish, cooled in a desiccator and weighed. The liquid from the flask is brought to a boil and together with the particles of fatty acid sticking to the sides of the container is thrown onto a previously weighed and wet filter paper. The paper is dried, cooled, and weighed. Analyses are given of several toilet soaps. Cf. *C. A.* 12, 1707.

F. S. HAMMETT.

Analysis of clay soap. W. D. COHEN. Heemstede. *Chem. Weekblad* 16, 144-5(1919).—The large amt. of filler in clay soap makes a complete sepn. of the fatty acids difficult. Good results can be obtained by driving very thin shavings of the soap to const. wt. at 105° and extg. with 96% EtOH in a Soxhlet extractor. The clay can also be detd. by drying the thimble at 100° and weighing. The samples analyzed conformed in general quite closely to the government requirements of 20% fatty acid with a sapon. number of not less than 225, and 66% of clay.

JULIAN F. SMITH.

Determination of loss of oxygen during the use of oxygen-yielding bleaching and washing materials (GRÜN, JUNGSMANN) 25. Fat extraction apparatus (GRIFFITHS-JONES) 12. Device for determining the dropping point of fats, etc. (DUPRÉ) 1. Bolly refuse (DOWELL, FRIEDEMANN) 12. Safflower oil as a drying oil (MANN, KANTKEAR) 26. Examination of drilling oils and their substitutes (MARCUSSEON) 22.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

**Simplified preparation of the cuprosodic reagent for the detection and determination of sugar.** ED. JUSTIN-MUELLER. *J. pharm. chim.* 19, 18-20(1919).—To 100 cc. of NaOH soln. of 39° Baumé (d. 1.370, or 33.69%) add slowly, while stirring, 20 cc. of 10% CuSO<sub>4</sub> soln. A clear, blue soln. of permanent titer is obtained, which remains blue and limpid even when dild. with H<sub>2</sub>O and brought to boiling. It may be used in place of Fehling soln. in detn. of sugar in urine. With NaOH soln. below 37° Bé., or when increasing the amt. of CuSO<sub>4</sub> at 39° Bé., soly. diminishes, although clear solns. are obtainable down to 30° Bé.; boiling after dild. with H<sub>2</sub>O, however, causes black pptn. S. WALDBOTT.

**Note on the colloid chemistry of Fehling sugar test.** MARTIN H. FISCHER AND MARIAN O. HOOKER. *Intern. Sugar J.* 21, 76-8(1919).—See C. A. 11, 2852.

F. W. ZERBAN.

**The future sugar industry in Siam.** LEWIS S. WARE. *Sugar* 20, 490-2(1918); 21, 19-21(1919).—The article points out the many natural advantages for the development of a cane sugar industry along modern lines.

F. W. ZERBAN.

**Central Romana.** JAMES SCOTT. *Sugar* 21, 7-14(1919).—A detailed illustrated description of this modern cane mill just completed in Santo Domingo.

F. W. ZERBAN.

**Simplified calculation of stocks.** WALTER E. SMITH. *Sugar* 21, 79-80(1919).—A system of daily stock taking has been devised which permits rapid tracing of abnormal losses. All tanks are provided with floats or gage glasses and graduation marks. For some of the products in process factors were worked out experimentally. With the aid of a Monroe calcg. machine the entire operation of stock taking, through to the finished report, can be done in less than 45 min.

F. W. ZERBAN.

**Mill control.** F. W. BOLK. *Meded. Java-Suikerind. Techn. Serie* 1918, No. 1, 1-3; *Chem. Weekblad* 16, 77(1919).—A defense of a new system used in the sugar mills of the Dutch East Indies.

JULIAN F. SMITH.

**Specific gravity of fiber.** F. W. BOLK. *Med. Java-Suikerind. Techn. Serie* 1918, No. 2, 1-8; *Chem. Weekblad* 16, 81-2(1919).—A discussion of attempts to det. the sp. gr. of fiber in sugar mills. The importance of such detns. in practical work is questioned.

JULIAN F. SMITH.

**Microorganisms in the sugar mill.** W. J. TH. AMONS. *Ind. Merc.* 40, 724-5 (1917); *Chem. Weekblad* 16, 75-6(1919).—Raw cane juice contains many varieties of bacteria, the number per cc. differing widely from time to time. After it has passed the heaters, only the most resistive spores remain. Molasses generally keeps well. It sometimes contains the spores of a variety of *Aspergillus*. Deterioration of sugar is probably due to more than one kind of microorganism. Molds are known to have been responsible in some cases.

JULIAN F. SMITH.

**The effects of polyphenols in the manufacture of cane sugar in the tropics.** W. H. TH. HARLOFF. *Ind. Merc.* 40, 860-1(1917); *Chem. Weekblad* 16, 76-7(1919).—One cause of color in the treatment of cane juice is the alk. decompn. of glucose, yielding brown products. But more intense color is caused by the formation of polyphenols, which form Fe compds. If the sulfur treatment of the juice is thorough enough, no discoloration of the sugar need be feared.

JULIAN F. SMITH.

**A new conception of the theory of the clarification of cane juice.** S. S. PECK. *Intern. Sugar J.* 21, 70-2(1919).—A number of non-sugars, e. g., tannin, albuminoids

pectinous substances, silica, etc., exist in cane juice and other cane products in the colloidal state. The removal of these colloidal impurities is of great importance from the practical standpoint, and it is suggested that the application of the principles of colloid chemistry to the manuf. of cane sugar opens up an important field of research.

F. W. ZERBAN.

**The precipitation of sucrose from exhausted molasses.** J. L. M. VAN DER HORN VAN DEN BOS. The Hague. *Chem. Weekblad* 16, 141-3(1919).—In connection with the article on this subject by Prinsen-Geerligs (*C. A.* 12, 1424), attention is called to British pat. 1,817 of 1882, by J. H. Johnson.

JULIAN F. SMITH.

**Molasses formation from the standpoint of the phase rule.** F. V. D. LINDEN. *Ind. Merc.* 40, 723(1917); *Chem. Weekblad* 16, 75(1919).—From the standpoint of the phase rule, exhausted molasses is a mixt. of sucrose and several other components, satd. with respect to sucrose and 1 other component. Beet sugar molasses is generally purer than that from cane, because it contains salts having relatively high m. p. The Java refineries have not yet settled the question of whether their molasses is exhausted or not. The influence of various salts and different sugars on the soly. of sucrose should be studied.

JULIAN F. SMITH.

**Industrial alcohol from molasses.** J. P. FOSTER. *Intern. Sugar J.* 21, 75(1919).—Industrial alc. can be manufd. from molasses with little difficulty. Very active pure culture yeast, acclimated to high temp., must be used. The molasses must be sterilized, and only condensation water from the effects used for dilution. The tubs must be provided with cooling coils, and should be filled not more than half full. Very little skilled labor is required.

F. W. ZERBAN.

**Making money from bagasse.** WALTER BAUNARD. *Sugar* 21, 122-3(1919).—The price of paper is high, while fuel will probably be cheaper, on account of new oil discoveries and of new processes for the utilization of lignite and peat. Under these circumstances it would pay better to use bagasse for paper making than for fuel.

F. W. ZERBAN.

**Recovering potash and nitrogen.** ANON. *Sugar* 21, 143(1919).—In a process, credited to Oppenheim, devised to recover not only the potash, but also the nitrogen in Steffens house waste waters and similar liquors, the combustion gases from the incinerator first pass through a condenser with baffle plates, catching tar and pitch, and are then absorbed in dilute  $H_2SO_4$ . A down-draft exhaust fan at the end of the system facilitates the movement of the gases.

F. W. ZERBAN.

**An automatic forced feeding cane mill.** ANON. *Louisiana Planter* 61, 380-1(1918).—Longitudinal slots are cut in the top roll, in which are inserted bars supported by springs. The bars are prevented from coming out of the roll by a shoulder on the slot, and the slot is deep enough so that the bar recedes till flush with the roll when pressure comes on it. The device was invented by A. Erlekens. W. L. BADGER.

**Bagasse feeders, furnace design, and furnace control.** A. GARTLEY. *Louisiana Planter* 62, 25-8(1919).—Not over 50% excess air should be needed for bagasse, corresponding to 14%  $CO_2$ . Generally not over 2.5 lbs.  $H_2O$  are evapd. per lb. of bagasse, 3 lbs. at the most. With step grates, 100 to 120 lbs. bagasse per sq. ft. grate surface per hr. is the max. Necessary points in furnace design are ample combustion space, highly heated radiating surfaces to dry the entering bagasse, and baffling to prevent secondary air short-circuiting to the bridge wall. Drawings of 4 furnaces are given. For boilers of 400 horse-power or over the grate surface needed becomes excessive, and the Cuban type is better. This is essentially a producer with many air inlets around the furnace at low levels. The usual aids to boiler-room efficiency are emphasized.

W. L. BADGER.

**Cane-preparing machinery, including crushers.** ANON. *Louisiana Planter* 62, 60-3(1919).—Report of committee on machinery, Hawaiian Sugar Planters' Assoc., for year ending Sept. 30, 1918. The present equipment of Hawaiian mills is summarized and the following recommended as representing best practice: Steel slat carrier nearly same width as mill; Krajewski or 3-roll crushers of same width and diam. as mill rolls; revolving knives or cane levellers; Searby shredding system; 12-roller mill. Graphs showing data for 13 factories show wide variations: H. P. per ton cane varied from 10 to 20; % dila. from 25 to 45; tons pressure per ft. of roll, from 50 to 80; sq. ft. roll surface per ton of fiber, from 180 to 275; and H. P. per ton fiber, from 65 to 165 per cent extn. was uniform; about 98 for all factories. Variations in H. P. are not due so much to diffs. in milling methods as to diffs. in friction due to wide variations in equipment.

W. L. BADGER.

**The Searby shredder and diffusion.** W. H. TH. HARLOFF. *Ind. Merc.* 40, 1053-5 (1917); *Chem. Weekblad* 16, 77-8(1919).—It is contended that the use of the Searby shredder for sugar cane is not a good method, because the shredded cane packs together too compactly to permit proper circulation of the diffusion liquid. JULIAN F. SMITH.

**Problems of cane fertilization.** ARTHUR H. ROSENFELD. *Sugar* 21, 24-6, 61-4, 118-9(1919).—A large number of fertilizer tests made with native canes in the province of Tucuman, Argentina, from 1911 to 1914, gave such contradictory and largely negative results that no recommendations can be made.

F. W. ZERBAN.

**Report of committee on agricultural progress of the Louisiana Sugar Planters' Association for the year 1918.** STEPHEN C. MUNSON, *et al.* *Louisiana Planter* 62, 171-3(1919).—The principal developments of chem. interest are the growing appreciation of legumes and manures as soil builders, and the continued good results from the seedling L 511, which yielded 3 1/3 tons of sugar per acre.

F. W. ZERBAN.

**Soluble starch for laundry purposes.** O. REINKE. *Chem. Ztg.* 42, 422(1918); *J. Soc. Chem. Ind.* 37, 652A.—Since rice starch is no longer obtainable in Germany potato starch which has been rendered sol. is suggested as a substitute for starching collars, etc.

E. J. C.

**New top-dressing for sugar-beet (HOFFMANN) 15.** Determination of fructose in presence of aldoses (HERZFELD, LENART) 7. Cane fertilization (ROSENFELD) 15.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

**Theory and practice of leather chemistry.** JOHN ARTHUR WILSON. *J. Am. Leather Chem. Assoc.* 14, 93-102(1919).—Competition between the several tanneries is a permanent bar to any general discussion of details of leather manuf., even though the fundamental principles underlying any of the processes is known. But the individual as well as the industry as a whole is benefitted by coöperative development of basic laws. The Assoc. can therefore be of great service to the industry by stimulating theoretical discussions. Indications of how to bridge the gap between theory and practice are given by treating the subjects of the effect of hard water upon tannins, tannin analysis, and vegetable tanning. A letter from T. A. Faust is included.

J. A. W.

**Modern theories of the various methods of tanning.** LOUIS MEUNIER. *J. Am. Leather Chem. Assoc.* 13, 530-3 (1918).—See C. A. 12, 2706.

J. S. ROGERS.

**Chrome leather problems for research laboratories.** E. J. WHITE. *J. Am. Leather Chem. Assoc.* 14, 2-5(1919).—Attention is called to the following problems

which are typical problems which might be investigated by private research labs.: (1) The study of the neutralization of chrome leather; (2) the dyeing and fat liquoring of chrome leather; (3) the interference of As in 2-bath chrome tannage; (4) the adsorption of chromic acid from the first bath.

J. S. ROGERS.

Utilization of leather and horn waste, etc. (DONATH, ULRICH) 15.

"Leather substitute." M. SCHUEER. U. S. 1,291,180, Jan. 14. A "leather substitute" is formed of a carrying vehicle such as paper or a woven fabric and a facing of supple pyroxylin built up of successive layers united into an integral structure of sufficient thickness that it may be removed from the carrier. The coating may be formed of nitrocellulose 10, castor oil 20, amyl acetate 15, MeOH 20, amyl alc 5, C<sub>2</sub>H<sub>5</sub> 30 and pigment 3 parts.

Waterproofing compositions for leather. H. C. TRENAMAN. Brit. 121,587, Oct. 1, 1918. See U. S. 1,269,658 (C. A. 12, 1935).

### 30. RUBBER AND ALLIED SUBSTANCES. •

JOHN B. TUTTLE.

Gas defense equipment and the rubber industry. C. R. JOHNSON. *India Rubber World* 59, 292-301(1919).—A description of the development and manuf. of the gas masks for the U. S. Army. The article is profusely illustrated and gives considerable detail regarding the various processes.

JOHN B. TUTTLE.

Notes on cemented seams and rubber cements. JUNIUS DAVID EDWARDS AND IRWIN L. MOORE. U. S. Bureau of Standards. *Rubber Age* 4, 421-3(1919).—The authors confine themselves to a study of seams and cements used in balloons. Seams were prep'd. by washing with gasoline the surfaces of the fabrics to be cemented. Two coats of cement were applied, the second before the first had dried completely. Before the second was dry, the two surfaces were lapped for 0.5 in., rolled together with a steel roller, and allowed to set for 24 hrs. before testing. Test strips 1 in. wide were cut and suspended in an oven at a const. temp., under a tension of 1 kg., and the time required for the seam to break was noted. At room temp. the tests ran in the following order, the strongest being placed first: Al surface to Al; rubber to Al; rubber to rubber; rubber to cloth; cloth to cloth. The same relative order held up to 75°, although the differences were smaller. This was also true for increasing loads at 55°. Different widths of lap were tested at 60°; over 0.5 in. the strength increased rapidly.

JOHN B. TUTTLE.

Estimation of sulfur in vulcanized rubber. H. P. STEVENS. *Analyst* 43, 377-8 (1918).—A half g. sample is digested 2 to 3 hrs. in a Kjeldahl flask with 20 cc. of concd. HNO<sub>3</sub> and 0.5 g. of KClO<sub>4</sub>. It is evap'd. to dryness in a porcelain dish with the addition of 3 g. of Mg(NO<sub>3</sub>)<sub>2</sub>, then digested 1 hr. with 10 cc. concd. HCl, dild., filtered and ppt'd. with BaCl<sub>2</sub> in the usual way. S. concludes that the method gives the same results as the Carius method.

A. H. SMITH.

The rubber stress-strain curve. P. SCHIDROWITZ AND H. A. GOLDSBROUGH. *India Rubber J.* 57, 269-70(1919).—When subjecting a mixt. of 100 rubber: 8 S to a series of 22 cures at 141° for 15-405 min., the authors did not observe any tendency to "reversion" in the curves. With a mixt. containing less S (mixt.: 70 rubber, 27 inert filler, 3 S), vulcanized over a shorter range, they observed some tendency to reversion. These observations agree with those of de Vries and Hellendoorn (C. A. 13, 916). The authors note that, compared with the original progression of the curve

down the paper, the reversion appears to be slow. They give it as their experience that mixings containing mineral accelerators behave differently from the mixings mentioned above, on subjecting them to a series of increasing cures. The reversion of the curve up the paper is much more marked and rapid (data are lacking as to whether the reversion is coincident with complete combination of the S); the final stage of the curve changes in slope ("type"); the curve may even change in character, so that instead of being concave to the load axis it becomes convex. The phenomena discussed are in accord with the view that in the process of vulcanization two main factors are operative: (1) A process of integration, peptization, "firming up," which consists of the chem. process of combination of S with rubber, and (2) a disintegration or degrading process due to the heat effect as such. When further combination with S is no longer possible, the heat effect becomes apparent and causes reversion or degradation. The authors suggest that a study of the reversion of the stress-strain curves should be of value in permitting a rapid and accurate estn. of over-heating as opposed to over-curing in the manuf. of goods cured with minimum proportions of S. G. S. WHITBY.

Further data on the moisture content of plantation rubber. O. DE VRIES. *Archief Rubbercultuur* 2, 852-60(1918); *Med. Centraal Rubberstation* No. 12, 1-9; cf. Whitby, C. A. 12, 2710.—Data are given showing that procedures (such as dilution of the latex, soaking freshly rolled crepe or sheet in water, rolling the coagulum on the day of coagulation instead of on the following day) which result in a reduction in the amt. of serum solids in the rubber lower the amt. of moisture retained. The presence of  $\text{NaHSO}_4$  causes some increase in the moisture content. G. S. WHITBY.

The changes in vulcanized rubber during the first days after vulcanization. O. DE VRIES and W. SPOON. *Archief Rubbercultuur* 2, 807-16(1918); *Med. Centraal Rubberstation*, No. 11, 39-48.—The authors find that the figures obtained for tensile strength are identical whether the period of rest between curing and testing is 1, 2, 3, 4 or 5 days. The position of the stress-strain curve was influenced by the length of the period of rest, but only to a very slight extent; the curve obtained after 24 hrs. was higher than that obtained after 72 hrs. by an amt. represented by 5-10% length at 1.30 kg. and corresponding to 2-3 min. on the cure. Comparing the results after 24 hrs. among themselves: they were quite as regular as those obtained after a longer rest compared in the same way. From Jan. 1, 1918 on, the Centraal Rubberstation has adopted a rest of only 24 hrs. in their testing work. G. S. WHITBY.

Changes in vulcanized rubber at elevated temperature. O. DE VRIES. *Archief Rubbercultuur* 2, 792-806(1918); *Med. Centraal Rubberstation*, No. 11, 24-38.—This extends the work given in C. A. 11, 1335. The author studies particularly the changes in the tensile strength and the position of the stress-strain curves produced in mixt. of 92.5 rubber: 7.5 S which have been cured at  $148^\circ$  for periods of 70, 90 and 110 min. by subjecting them to artificial aging tests consisting of heating for periods up to 16 days at  $65^\circ$  and at  $72^\circ$ . The stress-strain curve is found to shift its position in a way analogous to that brought about by continued curing at  $148^\circ$ . The extent of the shifting during the first day is smaller, the longer the sample has been cured; but during the following days the changes for the differently cured samples are parallel. The change in the tensile strength also is similar to that produced by prolongation of curing at  $148^\circ$ , but the magnitude attained before a drop sets in is not so high. Briefly, the curves come down the paper as with prolongation of the curing, but become shorter in length than those given by prolongation of the curing. The following are actual results: A sample cured for 70 min. and then "aged" at  $72^\circ$  for 24 hrs. gave a curve and tensile strength approx. the same as those produced by curing for 90 min., but the coeff. of vulcanization was 2.3 as compared with 3.09. Another sample cured for 70 min. gave after aging at  $65^\circ$  for 73 hrs. a curve and tensile strength identical with those produced

by curing for 90 min., but the coeff. of vulcanization was 2.42 as compared with 2.82. In both cases prolongation of the aging beyond this point reduced the tensile strength, whereas prolongation of the curing increased it.

G. S. WHITBY.

**Rubber substitutes.** ANON. *Caoutchouc & gutta-percha* 16, 9709(1919).—During the war, the use of the term "substitute" for vulcanized oils gave considerable trouble in France, especially with those officials who were not familiar with the technology of the rubber industry. Since these oils are not substitutes, but are used on account of the special properties which they impart to rubber compounds, it is urged that the term "substitute" be dropped because it is misleading.

JOHN B. TUTTLE.

**Chrysanthamnus or Sierra rubber.** ANON. *India Rubber World* 60, 349-50(1919).—Among the native wild plants containing rubber, "Common Green," a variety of *Chrysanthamnus naseousus*, is mentioned as a possible source of rubber, especially should importations be stopped for any cause. It could not be produced to compete with plantation rubber at the present market price. Tests by Spence show that it is of good quality, better than most African rubbers, and vulcanizes readily.

JOHN B. TUTTLE.

**Rubber cultivation in the Philippines.** HENRI JUMELLE. *Caoutchouc & gutta-percha* 16, 9703-4(1919).—A review of the development of the rubber plantation industry in the Philippines.

JOHN B. TUTTLE.

**Analysis of antimony pentasulfide.** D. REPNY. *India Rubber World* 60, 360-1 (1919).— $\text{Sb}_2\text{S}_5$  is tested for adulteration by treating 5 g. in 100 cc. 10% NaOH soln. with heating on steam bath until no red particles are observed; any red insol. particles indicate adulteration. A white residue may be  $\text{CaSO}_4$ ,  $\text{CaCO}_3$ ,  $\text{BaSO}_4$ ,  $\text{SiO}_2$  or  $\text{Sb}_2\text{O}_4$ .  $\text{Sb}_2\text{S}_5$  should be about 4.20 sp. gr., and neutral or less than 0.01 % acid. For acidity, place 2 g. in a filter and wash with water until the latter is neutral; then titrate with 0.1 N NaOH, with phenolphthalein as indicator. For free S, ext. 5 g. with redistd.  $\text{CS}_2$  for 10 hrs. Dry the ext. at 60°, weigh the free S and reserve for other tests. Take  $\frac{1}{5}$  of the residue, dry at 100° to const. wt. to det. moisture and water of crystn. Test qual. for  $\text{CaSO}_4$  by shaking a small portion of the sample with water, filter and add  $\text{BaCl}_2$  soln. If no ppt. is obtained the  $\text{Sb}_2\text{S}_5$  is ready for further investigation; otherwise proceed as follows: Take  $\frac{1}{5}$  of the residue from the free S detn., place on a filter and wash with cold water until nothing further is extd.; then dry in weighed beaker at 100° and weigh the  $\text{CaSO}_4$ . Transfer the residue on the filter to a beaker, add 100 cc. 10% NaOH and heat 10 min. on steam bath. If complete soln. is obtained further analysis is unnecessary. If not, allow the residue to settle, decant, add 50 cc. water and filter. Wash until neutral. Wash the residue on the filter into a weighed beaker, allow it to settle, decant, and dry the remainder to const. wt. This gives total adulteration. Red color indicates  $\text{Fe}_2\text{O}_3$ ; white may be  $\text{BaSO}_4$ ,  $\text{CaCO}_3$ ,  $\text{Sb}_2\text{O}_4$ ,  $\text{MgCO}_3$ , etc. Make qual. tests for these constituents.

JOHN B. TUTTLE.

**Vulcanizing rubber.** W. A. GIBBONS. U. S. 1,291,828, Jan. 21.  $\beta$ -Dinitroanthraquinone is added to rubber in the proportion of about 3-30% to serve as a vulcanizing agent; preferably PbO is used as an accelerating reagent, at a temp. of 140-150° for 1-2 hrs.

**Brake-lining fabric impregnated with rubber.** C. H. OAKLEY. U. S. 1,292,027, Jan. 21. Asbestos yarns are treated with a rubber soln. to coat them with rubber, the solvent is allowed to evap., powdered starch is applied to the yarns as a lubricant to facilitate weaving, and, after weaving, the fabric is subjected to a vulcanizing treatment.



# CHEMICAL ABSTRACTS

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## I. APPARATUS.

L. C. JONES.

**Substitutes for platinum in electrolytic apparatus.** PAUL NICOLARDOT AND JEAN BOUDRET. *Bull. soc. chim.* 25, 84-6(1919).—Continuation of a previous article (cf. *C. A.* 13, 677). As a cathode the authors found an alloy of 90% Au and 10% Cu quite satisfactory. A cylinder 50 mm. diam., 65 mm. high and weighing 23.5 g. lost 1 mg. after 20 detns. (Cu in  $\text{HNO}_3$  or  $\text{H}_2\text{SO}_4$ ; Ni in  $\text{NH}_4\text{OH}$ ; Sb in  $\text{Na}_2\text{S}$  and  $\text{NaCN}$ ). The only precaution to be observed is to avoid heating in a flame. The same alloy was found suitable as the anode after being electrolytically coated with a thin layer of Pt and then carefully polished and burnished. F. W. SMITHER.

**Hydrogen recorder.** ANON. *Chem. Met. Eng.* 20, 191(1919).—A falling Hg column samples the gas and furnishes the driving force for passing it through the app. The outside source of power may be air or  $\text{H}_2\text{O}$ . The gas is passed through a cartridge in an elec. oven which oxidizes the  $\text{H}_2$ , and the resulting contraction is measured. W. L. BADGER.

**An electrical precipitator for analyzing smokes.** R. C. TOLMAN, L. H. RYERSON, A. P. BROOKS AND H. D. SMYTH. *J. Am. Chem. Soc.* 41, 587-9(1919).—The app. consists essentially of a modified Cottrell precipitator with a central wire as cathode surrounded by a cylindrical foil as anode. The smoke to be analyzed is drawn through the app. at a known rate and the particles are pptd. on the foil by means of high voltage d. c. The concn. is calcd. from the increase in wt. of the foil and the vol. of air passed through. The foil was exceedingly light so that the material pptd. should form a considerable part of the total weight. Al foil 0.001 inch thick was satisfactory. It is also important to have the wire exactly centered to prevent sparking, and this was further prevented by threading the wire with a jeweler's die. E. B. MILLARD.

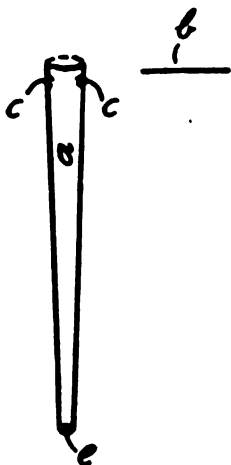
**Laboratory furnaces.** ANON. *Elec. Rev.* 74, 524-5(1919).—A small crucible furnace, a horizontal tubular furnace and a muffle furnace are illustrated. All types can be regulated by external rheostat to give const. temps. up to  $995^\circ$ . They are well built and may be mounted on any convenient surface. The crucible furnace has a chamber 6.87 cm.  $\times$  5.24 cm. and requires 350 w. at 110 v. The muffle type has wide application, but is ideal for treatment of delicate dies and tools where exact temp. control is essential. W. H. BOYNTON.

**Effective improvized gas-washing apparatus for laboratory use.** ANON. *Gas World* 70, 121(1919).—The app. consists of an ordinary 12-pear fractionating column, sealed at the lower end. Fitted in the top is a one-hole rubber stopper through which passes a glass tube, bent at right angles and reaching nearly to the bottom of the app., serving as the gas inlet. The liquid for washing the gas should reach, when no gas is passing, about as high as the third or fourth pear. The gas can be passed through at a rate of 5 cu. ft. per hr., using a  $\frac{3}{16}$ -in. bore tube as inlet, without losing any of the liquid by spraying and at the same time insuring complete absorption. The app. is a very efficient washer but is not suitable for gas at low pressures owing to the heavy

seal required. This difficulty may be overcome by working the app. in a sloping position, or by applying a small amt. of suction at the outlet. J. L. WILEY.

Continuous vacuum still for "mustard gas." ELFORD STREETER. *J. Ind. Eng. Chem.* 11, 292-4(1919); illus. F. W. SMITHER.

A new simple device for sampling. L. F. RILEY. *J. Soc. Chem. Ind.* 38, 598 (1919).—This device is particularly suitable for sampling dust (e. g., blast-furnace dust), loose soil, and the like. The end *e* (see sketch) of a tapering tube *a* of suitable dimensions is inserted into the material to be sampled and pushed to the bottom with a rotary motion by means of the easily removable handle *b* inserted through the 2 holes *c*, and then withdrawn. The sample is then obtained by removing the handle and inverting the tube. The samples obtained from various parts are then mixed in the usual manner. F. W. SMITHER.



An automatic compensating flow meter. G. G. OBERFELL AND R. P. MASS. *J. Ind. Eng. Chem.* 11, 294-6(1919).—The authors describe in detail, with drawing, a flow meter which was intended primarily for accurately controlling the gas concn. of gas-air mixts. F. W. SMITHER.

Accurate timing in electrical tests. F. A. KARTAK. *Elec. World* 73, 672-5(1919).—K. discusses stop watches and their inaccuracies for accurate measurement of short-time intervals, and describes tuning fork app. used at the Univ. of Wisconsin. It consists of the tuning-fork timing device developed at the Bur. of Standards with several modifications to increase its accuracy and reliability.

To eliminate any change in rate due to "fatiguing" of the steel fork blades, an electrochrome-silico-manganese spring steel of the following compn. was used: C 0.43, Si 0.65, Mn 0.85, Cr 0.9, P 0.018 and S 0.015%. A Hg contact is noiseless and eliminates the use of spring or metallic contacts, which would react mechanically on the fork. The counter consists of a high-grade clock mechanism in which the balance wheel and hair spring are replaced by the moving element of a polarized telephone ringer in such a manner that this moving element actuates the escapement of the clock. The action of the polarized relay taking place at the rate of 40 movements per sec. releases the escapement of the clock at the same rate and with the clock hands properly geared, causes a corresponding indication over the dial to take place. The temp. coeff. of the fork is 0.011% per degree. Time is measured in steps of 0.025 second and personal errors preclude the necessity of an increase in the beat of the fork, though it appears possible to increase it to 0.01 second. After being started manually, the fork is operated by a 110-v. d. c.

W. H. BOYNTON.

The use of standard dies in making ground-glass joints. S. F. ACKER. *J. Ind. Eng. Chem.* 11, 338-9(1919).—The author discusses the advantages of standard dies and describes the procedure adopted in his lab. F. W. SMITHER.

Nonsilverable containers for silvering mirrors. HERBERT E. IVES. *Science* 49, 330(1919).—The use is suggested of Se as a lining material of vessels for this purpose. Cf. Coblenz, *C. A.* 12, 2263; 13, 677. E. J. C.

Points in pump selection. B. N. EVERETT. *Chem. Met. Eng.* 20, 246-7(1919).—An outline is given of the points affecting the choice of a pump as follows: *Liquid to be pumped*—sp. gr., temp., viscosity, size and nature of suspended matter. *Total head*—pipe size, actual lift, pipe friction (to be considered on both suction and discharge

lines). *Capacity*—max. demand, av. demand, storage capacity, breakdown service, hrs. service per yr., advisable speed. *Power*—type available, reliability, amt. required, control, cost per 1000 gals., cost per yr., cost compared to investment. *Total cost*—pump, driver, piping, installation, labor, fixed charges, use of exhaust steam, efficiency, fuel consumption. Several instances are given illustrating the significance of these points.

W. L. BADGER.

**Vacuum electric apparatus.** H. A. NEWCOMB. U. S. 1,293,881, Feb. 11. An arc shield of alundum is used in vacuum elec. app. such as vapor arc rectifiers or X-ray tubes. The alundum shield may be retained within and in close contact with a receptacle formed of glass having a coeff. of expansion of 0.00036.

**Acetylene lamps.** A. L. HANSEN. Can. 189,455, Apr. 1, 1919. A generator adapted for use in miners' camps has a water tube extending from the water chamber to the carbide chamber and having its lower end formed to operate as a valve in a valve seat in the carbide chamber.

**Pyrometer.** G. F. MACHLET. U. S. 1,294,688, Feb. 18.

**Centrifugal apparatus and method of operating for forming tubular filaments of pitch, asphalt or similar materials.** R. P. PERRY. U. S. 1,293,535, Feb. 4.

**Apparatus for filtering water or other liquids.** C. S. SMITH. U. S. 1,293,649-50-1, Feb. 4.

**Distributing pulverulent lining in a soaking pit.** T. D. HODGE. Can. 189,098, Mar. 11, 1919. Pulverulent lining material is supported at the open top of the soaking pit and showered down upon the bottom of the pit in such a manner as to form troughs at opposite sides of the pit. App. is also specified.

**Distillation apparatus.** WM. PERRY. Can. 187,741, Dec. 3, 1918. Structure.

**Filler for gas- and liquid-reaction and contact towers.** A. M. WEBB. U. S. 1,293,270, Feb. 4. Reaction towers such as those used for the manuf. or concn. of  $\text{H}_2\text{SO}_4$ ,  $\text{HNO}_3$ , or  $\text{HCl}$  are filled with cylinders, each of which has a helical flange projecting from its inner wall. The flange is of less width than the radius of the cylinder, so that a continuous central opening is provided extending lengthwise through the cylinder.

**Light-filter.** H. T. CLARK. U. S. 1,293,039, Feb. 4. A light-filter for absorbing blue-violet and ultraviolet light is formed of gelatin or other light-transmitting material containing a salt of glucosephenylosazone-*p,p'*-dicarboxylic acid.

**Roasting furnaces.** F. J. BOWMAN. Can. 189,453, Apr. 1, 1919. A roasting furnace having horizontal chambers has ore supply passages extending vertically into each chamber and deflecting arches forming the lower portion of the passages. The descending material forms a pile against the arch member and thus seals the chamber at that point.

**Muffle furnaces.** T. W. S. HUTCHINS. Can. 189,105, Mar. 18, 1919. A series of chambers surrounding a gas producer has a muffle furnace in each chamber, the chambers are in intercommunication and each is connected with the producer. Each chamber has a port for the inflow of air to and the outflow of waste gases from the chamber. A control valve is placed in each of the communication ducts or ports.

## 2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

Robert Marc. H. FREUNDLICH. *Kolloid-Z.* 23, 81-5(1918).—A bibliography accompanies this obituary.

E. J. C.

The investigations by (Eduard) Jordis. M. K. HOFFMANN. *Kolloid-Z.* 23, 49-56(1918).—A bibliography accompanies this obituary. E. J. C.

Chemical research in the various countries of the world. E. J. CRANE. *J. Ind. Eng. Chem.* 11, 378(1919); cf. *C. A.* 12, 644.—A table shows the numbers and percentages of abstracts published by *Chemical Abstracts* during 1913, 1917 and 1918, resp., classified according to countries in which the papers reviewed originated. E. H.

The training of the chemist. EDWARD ELLERY. *J. Ind. Eng. Chem.* 11, 375-7(1919); cf. *C. A.* 13, 390. E. J. C.

The functions of a research laboratory. SAUL DUSEMAN. *Can. Chem. J.* 3, 118-21(1919).—An address in which are described the internal organizations and some of the successes of the research lab. of the Gen. Elec. Co. E. J. C.

First report of the Chemist's Organization Committee. M. A. PARKER, *et al.* *Can. Chem. J.* 3, 116-7(1919).—Recommendations in detail are given. These include the formation by Canadian chemists of a new organization to be known as "*The Institute of Chemistry of Canada.*" Objects are set forth. E. J. C.

Elements in the order of their atomic weights. RAYMOND SZYMANOWITZ. *Chem. News* 117, 339-40(1918).—Approx. values of at. wts. are found by alternately adding 3 and 1 to the at. wt. of H. In the resulting series of progressive numbers from 1 to 240 there are 121 numbers of which 66 correspond fairly well with detd. at. wts., 17 do not coincide with at. wts. and 38 numbers have no corresponding at. wts. and should indicate unknown elements. INGO W. D. HACKH.

\* Elements in the order of their atomic weights. F. H. LORING. *Chem. News* 117, 352(1918); cf. preceding abstract.—Attention is called to the Rydberg scheme (*Z. anorg. Chem.* 14, 66-102(1897)) and the calcns. of Comstock (cf. *C. A.* 2, 1913). The matter might be of interest provided one wishes to extend the scheme of isotopes to the non-radioactive elements. INGO W. D. HACKH.

Relation between the atomic weights of the chemical elements, densities, and heats of reaction. K. FEHLER. *Physik. Z.* 19, 281-6(1918).—It is assumed that the mols. of all elements are built up of the same fundamental units, which F. calls "atoms," and that the mol. is a homogeneous sphere filled with these "atoms" which rotate with a common angular velocity  $w$  about a common middle point. It is further assumed that the energy of a mol. of radius  $R$  is given by the equation  $U = CNw^2R^3$  and its mass by  $m = KNw$ . From these assumptions the following equation is derived for the heat of reaction when  $x$  mols. of one element unite with  $y$  mols. of another to form  $z$  mols. of a compd.:  $W = (1.534/z)[xA_1(\sqrt[3]{1/s_1} - \sqrt[3]{1/s_2} \sqrt{A_2/A_1}) + yA_2(\sqrt[3]{1/s_2} - \sqrt[3]{1/s_3} \sqrt{A_3/A_2})]$  kg. cal., in which  $s_1$ ,  $s_2$  and  $s_3$ ,  $A_1$ ,  $A_2$  and  $A_3$  are the densities and mol. wts. of the elements and compd., resp. In the case of metallic compds. the result must be multiplied by the sum of the valencies of the elements in order to give the heat of reaction for 1 mol. A table is given which compares the measured heats of reaction with those calcd. from this equation. In some cases fair agreement is obtained.

D. MACRAE.

The Neumann-Kopp law. FRIEDRICH BÜRKI. *Helvetica Chim. Acta* 2, 27-38(1919).—This law, somewhat differently stated by each of the 2 authors, has to do with the constancy of the at. heat of different elements, alone and in compds. It is usually stated for  $C_p$ . Bürki computes  $C_v$  for numerous substances by means of the usual formula involving expansion and compressibility. His data for  $C_p - C_v$  for the elements are as follows, given as differences in the atomic heats: Li 0.307, C very small, Na 0.53, Mg 0.15, Al 0.26, Si 0.26, P 1.59, S 0.29, K 0.63, Fe 0.13, Ni 0.25, Cu 0.23, Zn 0.34, Bi 0.08, As 0.01, Se 0.32, Br (liquid) 4.35, Ag 0.27, Cd 0.36, Sn 0.33, Sb 0.07, I 0.88, Cs 0.12, Pt 0.22, Au 0.27, Hg 0.92, Tl 0.38, Pb 0.33. Within any group of ele-

ments there is an increase of  $C_p - C_v$  with at wt. The N.-K. law is then tested for  $C_v$  with halides and various org. compds. with results whose considerable variability seemed to be partly chargeable to the fact that the elements were either gases or the diamond, whose values of  $C_p - C_v$  are not fairly comparable with those of the solid compds.

W. P. WERRA.

The fundamental values of the quantities  $b$  and  $\sqrt{a}$  for various elements in connection with the periodic system. II. Mercury and antimony. III. Survey of the individual groups of elements. IV. Elements of the halogen, oxygen and nitrogen groups. V. Elements of the carbon and titanium groups. VI. The alkali metals. J. J. VAN LAAR. *Z. anorg. allgem. Chem.* 104, 81-125 (1918).—See C. A. 10, 2816; 11, 413; 12, 1140.

E. J. C.

Equation of state for liquids and vapors. I. The vapor phase of ethyl ether. FREDERICK G. KEYES AND WILLIAM A. FELSING. *J. Am. Chem. Soc.* 41, 589-96 (1919); cf. C. A. 11, 2846.—A detailed discussion is given of equations of state, and the requirements of a satisfactory equation are reviewed. The older data for  $\text{Et}_2\text{O}$  have been reviewed with respect to Keyes equation of state,  $p = RT/(v - \delta) - A/(v - l)^2$  where  $\delta = \beta e^{-\alpha/v}$  and  $\beta, \alpha, A$  and  $l$  are consts. This equation is valid in case one type of atom or mol. alone is present, and the consts. become functions of the degree of association or dissociation in case either takes place. New measurements of the temp. and pressure corresponding to various sp. vols. have been made over a considerable range of temp. and vol. The isometrics are linear within the limits of accuracy of the measurements. It is indicated that in any system linear increase of pressure with temp. increase at const. vol. is the only reliable test for a single type of mol. and that departure from the linear isometric is due to polymerization or to change in the mol. system under consideration. The data of Amagat on liquid  $\text{Et}_2\text{O}$  have been discussed with reference to the equation for  $\delta$  (liquid phase) on the assumption that 2 of the vapor phase mols. associate in the liquid state to form a new mol. species  $[(\text{C}_2\text{H}_5)_2\text{O}]_2$ .

E. B. M.

Influence of the finite volume of molecules on the equation of state. M. N. SHAHA AND S. N. BASHU. *Phil. Mag.* 36, 199-202 (1918).—The departure of the actual behavior of gases from the ideal state defined by the equation  $p = NK\theta/v$  is due to: (1) the finiteness of the vol. of the mols., and (2) the influence of the forces of cohesion among the mols. This was first expressed by van der Waals. In subsequent modifications of van der Waals' equation of state, the changes proposed all relate to the influence of the cohesive forces, the finiteness of mol. vol. being generally left untouched. The exptl. results, however, do not agree with theoretical predictions of  $a$  and  $b$  regarded as absolute consts., and, accordingly, these have been considered as functions of temp. and vol. The present authors now examine whether the influence of finite mol. vols. is properly represented by the term  $b$ , and conclude that such is not the case. A more detailed investigation is promised with respect to the variability of the vol. of mols. with temp. Meanwhile the factor  $c = a/\sqrt{K\theta}$  has been introduced into the expression for  $p$  as a provisional measure.

S. C. LIND.

Determination of surface tension (free surface energy), and the weight of falling drops: the surface tension of water and benzene by the capillary height method. WILLIAM D. HARKINS AND F. E. BROWN. *J. Am. Chem. Soc.* 41, 499-524 (1919).—The surface tensions of  $\text{H}_2\text{O}$  and of  $\text{C}_6\text{H}_6$  at  $20^\circ$ , each against air satd. with its own vapor, were carefully detd. by the capillary rise method, using tubes selected and calibrated with great care, and numerous precautions too detailed to appear in an abstract. The values for water were:  $\gamma = 72.800$  dynes/cm.;  $a^2 = 14.897$  sq. cm. and for  $\text{C}_6\text{H}_6$   $\gamma = 28.80$  dynes/cm.;  $a^2 = 6.713$  sq. mm. One of the features of the work was the steaming out of the tubes with the vapor of the substance. This increased the value of  $\gamma$  for

water about 0.1 dyne.  $\text{H}_2\text{O}$ ,  $\text{C}_4\text{H}_8$ ,  $\text{CCl}_4$ , and  $\text{C}_2\text{H}_5\text{Br}$  were dropped from a large number of tips of glass and metal with radii varying from 0.09946 cm. to 1.0028 cm., and the weights of the falling drops detd. From these data ( $r/a$ ) and corresponding values of  $f(r/a)$  for the Lohnstein equation  $Mg = 2\pi r\gamma f(r/a)$  were calcd. When ( $r/a$ ) varies  $f(r/a)$  is not const.; in general the latter rises when the former decreases in value.  $M$  is the mass of the drop,  $g$  has the usual meaning,  $r$  is the radius of the tip and  $a$  is the capillary const. In the equation  $a$  may be replaced by any other quantity which varies as a linear dimension of the drop. A new equation in which  $f(r/a)$  is replaced by  $\psi(r/V^{1/3})$  is recommended as more readily applied to the detn. of surface tension since all the factors except  $\gamma$  are obtained by expt. or reference to a table. Variations in density over a wide range and in viscosity over a moderate range did not appreciably affect the results obtained for the surface tension of liquids by the drop weight method. The wt. of a drop varies rapidly with its time of detachment; in general the time should be 5 min., but in some cases 30 min. or more was required for dil. solns. Open, thin-walled tubes when used as tips do not give as accurate results as heavy tubes or perforated disks. The precision of the method is now about 0.1%. An important source of error is that due to lack of sharpness, or to departure from the circular shape, of the tip. Other important sources of error to be avoided in drop-weight work are pointed out in detail.

E. B. MILLARD.

Some formulas concerning surface tension. ARTHUR C. LUNN. *J. Am. Chem. Soc.* 41, 620-1(1919); cf. Harkins and Brown, preceding abstract.—H. and B. in their tabulation of measurements of surface tension have used 2 alternative formulas connecting the weight of a drop with surface tension and other properties of the liquid. One of these is understood as chiefly empirical in origin, the other was previously deduced by Lohnstein on the basis of a solution by mechanical quadrature of the differential equation of the meridian curve. The principle of dynamical similitude alone leads to equations of the 2 types used by Harkins and Brown. L. suggests extensions of the equations which may be needed in more general cases. It seems possible that viscosity might have some influence.

E. B. MILLARD.

The critical temperature and pressure of mercury and phosphorus. J. J. VAN LAAR. *Z. anorg. allgem. Chem.* 104, 126-33(1918).—See C. A. 12, 875. E. J. C.

Experimental determination of the fictive heat of solution. ERNST COHEN AND H. R. BRUINS. *Z. physik. Chem.* 93, 43-58(1918); *J. Chem. Soc.* 114, II, 297-8.—The fictive heat of soln. is the heat produced when 1 mol. of a substance dissolves in an infinite amt. of its own satd. soln. Four methods for finding this are described, all of which depend on the use of a cell, in which the energy change accompanying infinitesimal changes of concn. can be measured by means of the e. m. f. Electrodes reversible with respect to one or other of the 2 ions are used. In the first method the differential e. m. f. of 2 sep. cells is used, one of which has satd. soln. with no solid, the other a very dil. soln. where heat of soln. can be directly measured. The passage of current in either cell causes the same action, except that the deposited ions go to or from a soln. of different concn. The chem. energy of the cell is thus the difference of the heats of soln. of the satd. and of the already measured soln. and this energy can be found by means of the Gibbs-Helmholtz equation, from the e. m. f. and the temp. coeff.  $dE/dT$ , of e. m. f. of the combination. The second method substitutes a single 2-fluid cell. Here the contact potential between the 2 solns. is a complication. The third method compares satd. solns. with and without solid phase. Here the difference in action is that in one cell there is transfer of material from solid phase to soln.; the chem. energy is the required fictive heat of soln. The fourth method detd.  $dE/dT$  by the relation  $(dE/dT)_1 - (dE/dT)_2 = (dE/dC)_T(dC/dT)$ , that is by detg. the change of e. m. f. with concn. and the variation of soly. with temp. This method was applied to  $\text{CdI}_2$ . The soly'

is:  $C = 44.18 + 0.0828t + 0.000183t^2$ .  $E_{18} = 0.43150 + 0.000283C - 0.00001428C^2$ .  $F$  comes out  $-1227$  small cal. at  $18^\circ$ , against  $-1246$  by method 3. W. P. WHITE.

**Relation between intensity of Tyndall beam and size of particles.** RICHARD C. TOLMAN, R. H. GERKE, A. P. BROOKS, A. G. HERMAN, R. S. MULLIKEN AND H. DEW. SMYTH. *J. Am. Chem. Soc.* 41, 575-87 (1919).—The method consisted in setting up a smoke of rosin in a confined space and making a set of simultaneous measurements of its Tyndallmeter reading and its concn., using the Tyndallmeter described in *C. A.* 13, 923. The general result of the work is to show that for the range of particles in actual smokes ( $5 \times 10^{-6}$  to  $10^{-4}$ ) and for particles in suspensions  $10^{-4}$  cm. in diam. up, the Tyndall beam becomes more intense at a given concn. the greater the subdivision. The suspensions were prepd. by mixing ground silica with water and carrying out fractional settlings and centrifugations. Size of particles was detd. by measurement with a micrometer microscope after evapg. a few drops of the suspension; concn. was detd. by evapg. larger samples and weighing the residue. In these expts. the intensity of the Tyndall beam increased with the subdivision. A discussion of these results and those of Mecklenburg (*C. A.* 9, 2831) with particles of  $S$  smaller than those used in these expts. is given. In accordance with Rayleigh's law the Tyndallmeter reading increases are proportional to the cube of the diam. of the particle; but for larger particles the reading is proportional to the number of particles and to their reflecting surface.

E. B. M.

**Investigations dealing with the state of aggregation. IV. The flocculation of colloids by salts containing univalent organic ions.** S. B. SCHRYVER AND NITA E. SPRUE. *Proc. Roy. Soc. London* 90B, 400-14 (1919).—Detn. was made of the pptg. capacity of salts containing org. ions, the  $N$  solns. of which exhibit wide variations in their surface tensions. The salts used were (a) the Na salt of:  $\text{HCOOH}$ ,  $\text{AcOH}$ , mono-, di-, and trichloroacetic, lactic, salicylic, benzoic, and benzenesulfonic acids; (b)  $\text{NaCl}$ ,  $\text{NH}_4\text{Cl}$ , and the hydrochlorides of:  $\text{MeNH}_2$ ,  $\text{Me}_2\text{NH}$ ,  $\text{Me}_3\text{N}$ ,  $\text{Et}_3\text{N}$ , iso- $\text{AmNH}_2$ ,  $\text{C}_6\text{H}_{13}\text{NH}_2$ , benzylamine, and piperidine. The colloidal solns. included those of  $\text{Fe}(\text{OH})_3$ ,  $\text{Zr}(\text{OH})_4$ ,  $\text{Ce}(\text{OH})_4$ ,  $\text{As}_2\text{S}_3$ , Victoria blue B, azo-blue, brilliant Congo-red R, scarlet Au sol, and mastic. "In general, no relationship was found to exist between the surface tensions of the  $N$  solns. and the flocculating capacity of salts. When a series of salts was compared in which the varying ion was not the active pptg. ion, the pptg. limits were all within a comparatively narrow range, in spite of the wide variations of the surface tensions of the solns. In the series, when the varying ion was the active ion, the range was large, although the pptg. capacity could not be generally correlated with the surface tension. The marked exception to this statement was shown in the case of mastic, when pptd. by the (hydro) chlorides. In this case the salts of low surface tension exhibit the greater flocculating power (with the exception of  $\text{NEt}_4\text{Cl}$ ). It is suggested that suspensoid colloids may be subdivided into classes; (a) those, like  $\text{Fe}(\text{OH})_3$ , which owe their charge to association with 'active' ions derived from salts from which they have been prepd., which are removed during aggregation, which results finally in flocculation, and which may be termed 'exionic colloids;' (b) those owing their charge to the dissociation of the colloid itself, in which a rapidly diffusing ion (such as  $\text{H}$  ion) forms the outer layer, and is held electrostatically to a less diffusible ion. These may be termed 'endionic colloids.' Mastic is probably a colloid which belongs to this class."

JOSEPH S. HEPBURN.

**The institute for research on colloids of the "Neuburg Foundation."** H. BRCH-HOLD. *Kolloid-Z.* 22, 44-6 (1918).—An illustrated description. E. J. C.

**Oil films on water.** G. ERCOLINI. *Nuovo cimento* 15, 49-88 (1918); *Sci. Abstracts* 21A, 481.—E. discusses in detail the exptl. difficulties of observations; and

concludes that it is only known with certitude that the min. thickness is of the order of a mol. diam. (about  $1 \mu\mu$ ); that on diminishing the area of such a film there is a formation of microglobules, but it is not possible to say whether the whole of the film is transformed into these; and the thickness of a film in presence of an excess of oil depends on the conditions of its formation, but the method of max. distension used in order to det. this thickness is lacking in precision.

E. J. C.

**Measurement of the thickness of film formed on glass and sand.** EARL PETTJOHN. *J. Am. Chem. Soc.* 41, 477-86(1919).—About 200 g. of the air-dried sample of river sand was weighed and transferred to a flask closed by a stopper bearing a weight-buret. Liquid was run in a drop at a time and the flask was thoroughly shaken after each drop until a final addition of liquid caused several of the grains to stick to the walls of the flask. The weight of liquid gave the amt. used when a film of max. thickness formed. Similar expts. were made with glass pearls and sands of different mesh. The surface was measured by counting and weighing 5000 or so grains, detg. the sp. gr., and calcg. the area on the assumption that the grains were spheres. Several org. liquids were studied in the same connection. Evidence is presented to show that the liquid forming the film does not combine chemically with the solid. The thickness of film formed is independent of the liquid used and of the size of the solid particles.

E. B. MILLARD.

**Experimental study of the development of crystals.** RENÉ MARCELIN. *Ann. phys.* 10, 185-8(1918).—By an optical method, the details of which are not given, crystalline layers so thin that they show Newton's rings are examd. It is possible not only to obtain evidence of the existence of the net-planes, but actually to measure the distance between them: Growing crystals are studied. In the case of crystals of *p*-toluidine growing from an alc. soln. the growth is by small additions of constant thickness to the faces, this thickness being of the order of three mols. In the process of soln. the reverse is true, except that different layers are of different thickness, being on the whole thicker than in growth.

F. C. HOYT.

**The chief points of our knowledge of liquid crystals.** O. LEHMANN. *Physik. Z.* 19, 73-80, 88-100(1918).—Illustrated and accompanied by numerous references.

E. J. C.

**Calculation of the extraordinary rays of certain structures of anisotropic liquids.** F. GRANDJEAN. *Compt. rend.* 168, 91-4, 408-10(1919).—Formulas are given for calcg. the value of the extraordinary refractive index from observations on the sepn. of the two images of a line viewed through the drop of anisotropic liquid.

E. T. W.

**Fractional combustion (preferential catalytic combustion of the gases of mixtures).** W. D. BANCROFT. *Trans. Am. Electrochem. Soc.* 32, 465-74(1917).—The question which of 2 gases in a mixt. will burn the more rapidly and the influence of catalysts on the course of the phenomenon are discussed. At low temps. the former may be detd. by the nature of the catalyst. The influence of CuO, chamotte and borosilicate on the combustion of mixts. of H and CH<sub>4</sub> is considered. In the presence of CuO at 250° all the H and none of the CH<sub>4</sub> in a mixt. of these gases burns, while in the presence of chamotte the former burns more rapidly than the latter. In borosilicate bulbs at 300° to 400° CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>4</sub> and C<sub>2</sub>H<sub>2</sub> burn more rapidly than either H or CO. When mixts. of CH<sub>4</sub>, O and H or CO are exploded by an elec. spark, the former burns much more rapidly than either the H or the CO. It is probable that charcoal would cause preferential burning of C<sub>2</sub>H<sub>4</sub> in a mixt. of this gas and H. It should be possible to obtain all intermediate stages from complete combustion of CH<sub>4</sub> to complete combustion of H in a mixt. of these gases by suitable selection of the catalyst. The sp. effect of a catalyst in influencing these preferential combustions probably disappears



at very high temps., because the reaction will occur so rapidly in the gas phase that the equil. reached will be that of the gas phase and not that of the catalyst.

H. JERMAIN CREIGHTON.

**The Hall-effect.** M. LA ROSA AND U. DE LUCA. *Nuovo cimento* 15, 89-99 (1918); *Science Abstracts* 21A, 509.—The nature of the secondary electrodes makes remarkable differences in the Hall-effect. Expts. are in progress to trace the cause of this.

E. H.

**Variable-pressure method for the measurement of viscosity.** E. C. BINGHAM. *Proc. Am. Soc. Testing Materials* 18, Pt. 2, 373-86 (1918).—B. sums up the difficulties encountered in measuring viscosities by the pendulum method and by the capillary-tube method, and points out the very marked advantages to be derived by modifying the present capillary tube viscosimeters so as to use variable pressures. The instrument described is accurate to a tenth of 1%, is easy to make and clean, and requires no special skill to operate. Cf. Bingham and Jackson, *C. A.* 11, 741 and Bingham, *C. A.* 8, 1525.

J. L. WILEY.

**Direct adiabatic calorimetry at high temperatures.** ALBERT PERRIER. *Lausanne. Arch. sci. phys. nat.* 46, 42-4 (1918).—The author discusses the difficulties and advantages of doing aneroid calorimetry adiabatically in electric furnaces, but makes no quantitative estimates. He considers non-uniform temps. and electrical leakages the main difficulties, but proposes to use only a pair of thermocouples to measure temp. The advantages claimed are: inexpensiveness, rapidity, the facts that the sample need not come in contact with water nor be protected from it, and the results are specific heats over short intervals.

W. P. WHITE.

**Determination of the temperature of the electrodes of the arc.** A. HAGENBACH AND K. LANGBEIN. *Arch. sci. phys. nat.* [5] 1, 48-54 (1919).—Ag, Cu, Fe, Ni and W were studied. The temp. was measured by a method of Lummer in which the relative brightness of 2 wave lengths is compared. This method is especially advantageous for surfaces which give far from black body radiation. A correction was made for the light emitted from the (gaseous) arc itself. The anode temps. are apparently the b. ps. of the respective metals. The cathodes are cooler, and so erratic that measurement was difficult. For feeble currents the anode temp. is lower, and by an amt. varying with the thermal cond. of the metal. The max. temps. observed were: Ag 2430° to 2450° (b. p. given by other observers from 2470° to 2680°); Fe, 2585° to 2605° (b. p. given from 2575° to 2730°); Ni, 2430° to 2450°; W, 4150° to 4250°. Al, Zn and Mg gave an arc based on an oxide layer or mass, with temp. far above the b. p. of the metal. In an atm. of N the anode temp. was the b. p.

W. P. WHITE.

**The conductivity of sea water.** H. R. RIVERS-MOORE. *Electrician* 82, 174-6 (1919).—The sample is placed in a glass tube having a pair of electrodes at either end. The inner electrode of each set is made of Cu gauze. Using a. c. the potential drop between the inner electrodes is balanced against that of a variable resistance in a Tinsley-Drysdale inductance and capacity bridge. (1) By audible frequencies, a sp. resistance given in tables is shown to be 26.5 ohms at 15°; (2) by radio-frequencies, varying from 30,000 to 100,000 p. s. the sp. resistance varied between the values 26 and 27 ohms, thus agreeing with previous method; (3) d. c. values of 26 and 26.2 ohms per cc. (15°) were obtained. Thus 26 to 27 ohms is the value for sea water near the mouth of an east coast estuary (Gt. Britain) for frequencies from 0 to 100,000 p. s. with c. d. from 0.01 to 15 milliamp. per (cm<sup>2</sup>). Open-sea samples gave at 15° a resistance of 24.3 to 24.7 ohms. The effectiveness of overcoming polarization is shown. It appears to be independent of the length of water column, being confined to electrode surface, and is usually of the order of 50 to 100 microfarads for electrodes of 2.7 (cm<sup>2</sup>). The capacity appears

to be independent of c. d. between 15 and  $\frac{1}{2}$  milliamp. per (cm<sup>2</sup>). Diagrams are given.  
F. W. ZONS.

Successive states of a gas under high pressure in a receptacle which is discharged through a tuyère. A. RATEAU. *Compt. rend.* 168, 435-9(1919).—Mechanica. Mathematical, applied particularly to a 75-mm. gun.  
R. E. HALL.

Denatured alcohol. DANIEL C. ROPER. *J. Ind. Eng. Chem.* 11, 379(1919).—Formula No. 30 for special denaturation of alc. for use by chem. and phys. labs. Approved Feb. 20, 1919.  
E. J. C.

The action of neutral chlorides on chromic chloride solutions (BALDWIN) 29. Ether and matter (LODGE) 3. Physical phenomena accompanying cathodic deposition of metals (KOHLSCHÜTTER, VUILLEUMIER) 4. System CaO-MgO-SiO<sub>2</sub> (FERGUSON, MERWIN) 6. Accurate timing in electrical tests (KARTAK) 1. The color of water (BANCROFT) 14.

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### 3. SUBATOMIC PHENOMENA AND RADIOCHEMISTRY.

GERALD L. WENDT.

An apparatus for the separation of radium emanation and its determination electroscopically. J. E. UNDERWOOD AND H. SCHLUNDT. *Trans. Am. Electrochem. Soc.* 34(1918), preprint.—An app. and method for the sepn. and collection of Ra Em prior to its detn. in an emanation electroscope. The Em is liberated by digestion with hot concd. H<sub>2</sub>SO<sub>4</sub> and is swept into the collection vessel by a current of air. It is retained over Hg a sufficient time to allow Th-Em to decay completely. The manipulative details are described fully and results are given on the detn. of Ra in a number of different materials.  
S. C. LIND.

Ether and matter. OLIVER J. LODGE. *Engineering* 107, 315-6(1919).—A lecture. I. discusses the attempts that have been made to ascertain whether the earth drifted through the ether, electric inertia, the structure of the atom, and the orbits of the electrons in the atom. In conclusion, the importance of studying the ether is pointed out.  
H. JERMAIN CRIGHTON.

The electronic theory of valence and of chemical affinity. J. A. CROWTHER. *Scientia*, Nov. 1917; *Rev. Sci.* 56, 591-3(1918).—A brief review of at. structure and its chem. significance.  
G. L. WENDT.

Radioactive bismuth hydride. FRITZ PANETH. *Z. Elektrochem.* 24, 298-9(1918). P. claims to have produced  $\text{BiH}_3$  by the use of one of the radioactive isotopes of Bi. A strip of Mg sheet was exposed to Th emanation, which deposited upon it Th B and Th C; the former is an isotope of Pb, the later of Bi. The Mg was then dissolved in dil. HCl and the gas evolved carried off into the ionization chamber of an electroscope by a stream of N. This gas showed the characteristics of Th C only. That a hydride was present is proved by the fact that Cl did not produce this effect when used instead of HCl.  $\text{BiH}_3$  is a gas, quite stable at ordinary temp., but its stability decreases rapidly with rising temp., and it decomposes completely at a red heat; it can be condensed in the manner usually employed with emanations. A new kind of radioactive gas has here been produced.  
C. S. BRAININ.

The question of electrical charges smaller than the electron. FRITZ ZERNER. Univ. Vienna. *Physik. Z.* 17, 165-8(1916); cf. *C. A.* 9, 2030.—A reply to Fletcher (*C. A.* 10, 407). The calcn. of the elementary charge of  $4.78 \times 10^{-18}$  e. s. u. from data on Brownian movements is in error because the equation used by Fletcher has been shown to be incorrect by Schroedinger (*C. A.* 10, 299), Smoluchowski (*C. A.* 10, 416) and Konstantinowski (*C. A.* 10, 837). Calcn. of the charge from the law of resistance, however, demonstrates the existence of charges considerably less than the above value for the electron.  
G. L. WENDT.

The relation between the K X-ray series and the atomic numbers of the chemical elements. WM. DUANE AND KANG-FUH HU. Harvard Univ. *Phys. Rev.* 11, 488-9 (1918).—Continuation of the measurements of Blake and D. (*C. A.* 12, 649) to cover all the elements from Mn to Ce (*i. e.*, from  $N = 25$  to  $N = 58$ ) shows that the critical absorption frequencies for these elements follow the equation  $\nu = \nu_0 (N - 3.5)^2$ , where  $\nu_0$  is the Rydberg constant and  $N$  the at. number; but there is a small systematic variation from this law. The curve obtained is not linear but bends slightly upward. This frequency might be expected to be a characteristic of the chem. elements that increases by equal amts. in passing from one to the next since it is: (1) the highest frequency known to be characteristic of the element, (2) the frequency for which  $V_e = 1/3mv^2$  holds ( $1/3mv^2$  being the energy of the electron required to produce the K-series), (3) the critical ionization frequency, and (4) the critical absorption frequency. Though this is not the case, a linear relation is obtained for the velocity of the electron required to produce the K-radiation, *vis.*,  $v = v_0 (N - 1.5)$ , in which  $v_0 = 0.006780 \times$  the velocity of light. This is the critical velocity for all elements from those of highest frequency down to Mg. That this critical velocity should be a linear function of the at. number may indicate that the fundamental laws connecting X-radiation with other characteristics of the chem. elements represent velocity relations and not energy relations.

G. L. WENDT.

An X-ray fluorometer with a radio-luminescent standard. GUILLEMINOT, H. CHERON AND R. BIGNARD. *Compt. rend.* 167, 594-5(1918).—The previous app. (*C. A.* 12, 450) is improved by the substitution of standard luminescence from a screen of ZnS containing 0.05 mg. Ra, which gives a luminescence of the same color as the fluorescence of the Ba platinocyanide used to estimate the intensity of the X-rays and which does not lose more than 5% of its luminescence in the course of a year. A very weak standard luminescence is thus chosen because it suffers relatively little diminution with time while stronger preparations die down rapidly. The fluorometer is intended to be simple, accurate and practical.  
G. L. WENDT.

The influence of exposure to ultraviolet light on the emission of infra-red radiation by metals. HEINRICH HÖRIG. Stuttgart. *Physik. Z.* 17, 178-91(1916).—A strip of silver foil, heated by an elec. current and exposed during the heating and subsequent cooling to ultraviolet light from a quartz Hg-lamp, cools more rapidly by about 3% than a foil similarly heated and cooled in the dark. Temperatures were measured by a thermocouple. No such effect could be found with a Pt-Ir foil. The results are considered as preliminary. A discussion of modern expts. on the relation between radiant energy and the heat energy of materials is appended. G. L. WENDT.

Researches on chemiluminescence. J. LIFSCHITZ. Univ. Zurich. *Helvetica Chim. Acta* 1, 472-4(1918).—A brief and very preliminary statement that aromatic organo-Mg compds. in ether soln. react with  $O_2$ , air and  $N_2O$  with light emission.  $NO$ ,  $NO_2$ ,  $CO_2$  and  $H_2O$  do not cause luminescence. The stability of the etherate of the Mg compd. seems to det. the luminescence. Addition compds. with dimethylaniline show a similar but weaker luminescence. G. L. WENDT.

X-Ray apparatus. WM. D. COOLIDGE. Can. 187,781, Dec. 3, 1918.

#### 4. ELECTROCHEMISTRY.

COLIN G. FINK.

Electrochemistry in its human relations. F. J. TONE. *Trans. Am. Electrochem. Soc.* 35, preprint; *Chem. Met. Eng.* 20, 413-6; *Manufact. Record* 75, 97-8(1919).—Presidential address. A clear exposition of the present status of electrochem. industries and a forecast of the future activities and responsibilities. Among the problems considered are: (1) The world's food supply and the production of electrochem. fertilizer bases, air nitrates, potash, phosphates and cyanamide; (2) sanitation and sterilization by means of Cl and Cl products; Cl in org. chemistry and metallurgy; (3) elec. steel and ferro alloys; (4) sources of energy, coal and water power. A. BUTTS.

Review of the electrochemical and electrometallurgical industries of Switzerland. 1913-1918. ANON. *J. four. Elec.* 28, 33-4(1919). C. G. F.

Government ownership of water-powers and electrochemical industry. F. A. J. FITZGERALD. *Trans. Am. Electrochem. Soc.* 35, preprint; *Chem. Met. Eng.* 20, 30 (1919); *Manufact. Record* 75, 93-5(1919).—Examn. of the operation and ownership of water powers by the Hydro-Electric Commission of Ontario shows that "all evils associated with government activities in fields other than those for which governments are instituted among men, have developed and that the largest individual users of elec. energy, the electro-chem. industries, will be the most direct sufferers therefrom." C. G. F.

Power needs of United States nitrate plants. E. R. WELLES AND C. T. MITCHELL. *Elec. World* 73, 677-9(1919).—An outline of the nitrate plants at Sheffield, Ala., Plant No. 1, has the  $NH_4NO_3$  process. The generating equipment consists of 3 turbines and a steam-driven exciter of 4,000 boiler-h. p. and 5,000 kw. turbine capacity, or 1.2 kw. per boiler h. p. Plant No. 2 has the cyanamide process and 60,000 kw. capacity and 18,000 boiler-h. p., or 3.3 kw. per boiler-h. p. Two of the turbines (Plant No. 1) are rated at 1875 kva, the third at 1250 kva. Power is developed at 190 v., 60-cycle 6-phase, and most of it is converted into d. c. in three rotaries installed opposite the turbines. W. H. BOYNTON.

Unit-cost estimates for small hydro plants. ANON. *Elec. World* 73, 742(1919).—Data on the construction cost of a 180-kw. installation in Massachusetts. The total cost was about \$277 per kw. C. G. F.

**Power in chemico-metallurgical industries.** FLUSIN. *Eng. Mining J.* 107, 479(1919).—A table showing the consumption of elec. power and raw material in the principal French electrochem. and electrometallurgical industries. Data are given for P, Cl, NaOH, chlorates, perchlorates, SiC, corundum, CaC<sub>2</sub>, cyanamide, Na, Al, Fe, steel, ferro-alloys, Si-Mn, Si-Ca, and Si-Al.

LOUIS JORDAN.

**Features of Muscle Shoals station.** E. R. WELLES AND W. A. SHOUDY. *Elec. World* 73, 729-33(1919).—A detailed description of the government Nitrate Power Plant No. 2. It serves the largest single industrial plant load in the world. The final total generator capacity will approximate 120,000 kw. The elec. furnace load is an ideal one and because of its great uniformity it is expected that the load factor will be about 90%.

C. G. F.

**Commercial electric furnaces and their uses. II.** F. T. SNYDER. *Automot. Eng.* 4, 29-32(1919).—An increase of 300% in the world use of elec. furnaces, and a 700% increase in U. S. in last four yrs. shows desirability. Increase in output, speed, and economy are features claimed. Structural superiority is recognized in the following points: 1. Greater density and freedom from blow holes are obtained. 2. Tensile strength is 10,000 lbs. per sq. in. greater than that of open-hearth steel. 3. Elastic limit is 5 to 15% greater. 4. Working yield-point is 20 to 50% greater. Advantages are said to be due to absence of O<sub>2</sub>, N<sub>2</sub>, slag, etc. The material is subjected to a higher temp. Alloys (such as those of V, Cr, Si, and Mn) can be maintained more closely to a standard, and less of these valuable metals is required. Alloy additions can be made to the furnace directly. There is less liability to segregate, and less danger of overheating. It has a wider "safe heat" range. The adaptation to ferro-alloys has resulted in less loss of material by oxidation, because of neutral atm. and more perfect heat control. Elec. furnaces are rapidly superseding the crucible process. The 140 electric furnaces in U. S. are said to produce 8 times the tonnage of combined crucible steel plants. It is to be preferred for highest class work and for critical requirements. A description is given of the doorless Snyder furnace, with particular reference to long arc, simple construction, heat loss, operation and power consumption. The applications of the three types of this furnace are briefly stated. F. W. ZONS.

**A small oscillating fusion furnace for voltaic arc and heating of combustible compounds.** CH. BRÉZOL. *J. four élec.* 28, 30(1919).—In a small app. if the temp., approximates 1300-1400° it is still insufficient to obtain the necessary fluidity for casting steel, and also where the m. p. is higher (1500 to 1600). It is thus not possible in a small combustion furnace to attain the desired result. By the elec. arc, with which the highest temp. can be obtained, the insufficient heat of the combustion furnace is augmented. The combination of the two sources of heat is the principle on which this furnace rests. While high elec. energy has simplified the problem of heating furnaces, the cost is high. 900 kw.-hrs. per t. represents approx. the thermolec. energy for one 4-hr. operation. The mass is first heated to the usual temp., 1300 to 1400°, and in the last stages an arc is produced, which results in an economy of current, and installation. An oscillating furnace, with mineral-oil burners, is charged with 500 kg. scrap Fe. The top of furnace is pierced by two electrodes, from which the arc reflects down upon the metallic mass previously heated to 1200-1300°. F. W. ZONS.

**Improving the quality of gray iron by the electric furnace.** GEO. K. ELLIOTT. *Trans. Am. Electrochem. Soc.* 35, preprint.—Results of experiences of two years at the Lukenheimer Company, Cincinnati, O. The demand is growing for high quality gray Fe castings, such as used for high-pressure steam valves and cylinders for internal-combustion engines. Strong iron requires a high pouring temp. not provided for by the cupola, and for such the author recommends the duplex process. Melt from the cupola

is superheated in a basic-bottomed arc elec. furnace. Practically all of the S is removed by this treatment. Close regulation of C is attained by addition of scrap steel. Mn is not affected. A 25-min. period of heating in basic-lined furnace under proper reducing slag will generally reduce S from 0.100% to 0.030% or less. Also in *Iron Age* 103, 939-40(1919). C. H. ELDRIDGE.

**The design and operation of a small Kjellin furnace.** GEO. H. STANLEY AND W. BUCHANAN. *Met. Chem. Eng.* 18, 416-20(1918); cf. *C. A.* 12, 1729; 13, 283.—The problem of designing the furnace is dealt with. The methods used for calcg. the following factors are given: cond. of the secondary, energy required, magnetic field, open circuit current, power factor, pinch effect, primary coil, preheating of scrap, and frequency converter. Some operating tests and operating costs are given.

LOUIS JORDAN.

**Steel manufacture in electric furnaces.** H. L. HESS. *Raw Materials* 1, 105-7 (1919).—A general comparison of the duplex and cold melt methods of elec. steel is given. In the duplex system the molten steel, partially refined in the open-hearth, is charged into the elec. furnace to finish refining. The method calls for two types of equipment and specialists for both. The cold melt method is the more simple, especially for small units of 10 tons or less. The raw materials are charged into 6-7-ton Heroult elec. furnaces for refining. Careful temp. regulation is required. Total power input = 600-900 kw. per ton. Casting and rolling of ingots is also described.

C. H. ELDRIDGE.

**Electric furnace in steel making.** ANON. *Elect. Times*, Dec. 26, 1918, p. 383.—The author believes that too little publicity has accompanied the rapid advance of the elec. furnace. He reviews at length recent progress made. F. W. ZONS.

**Electric heat-treatment of gun forgings.** C. E. WRIGHT. *Iron Age* 103, 673-8 (1919).—A description of the plant of the Tioga Steel & Iron Company, Philadelphia, with special reference to the installation and operation of electric heat-treating furnaces. The furnaces can be used for the general run of large commercial forgings.

E. G. JARVIS.

**Principles of inductive heating with high-frequency currents.** E. F. NORTHRUP. Univ. Princeton. *Trans. Am. Electrochem. Soc.* 35, 88 pp.(preprint).—A very comprehensive presentation of the development of elec. heating with high-frequency currents and without interlinkage of an Fe magnetic circuit with an elec. circuit. In the first part of the paper the theory and the basic principles underlying this new method of elec. heating are discussed at length. By the mathematical treatment it is shown that there is no theoretical limitation to either the voltages which can be employed with safety or to the size of the units or the amount of power which can be used in this method of heating. It is also shown theoretically that in all cases where the high-frequency current is obtained from an alternator the supply lines can furnish power at practically unity power factor, and that the possibilities of obtaining high thermal efficiencies, rapid heating and elevated temps. are equal to or better than the results obtained in these respects by standard methods of elec. heating. The second part of the paper is devoted to applications of the theory. As a source of high-frequency current, the Tesla oscillatory current circuit has been employed. A diagrammatic representation is given of the arrangement used for the production of high-frequency currents by oscillatory discharge. The following subjects are discussed, the discussion being illustrated with numerous diagrams and photographs: the storage of elec. energy, the release of elec. potential energy, practical methods for reducing local surges, conditions suitable for the production of successive oscillatory discharges, power condensers, forms into which elec. potential energy may be transformed, power transformation

into heat in a single oscillatory-current circuit, circuits used for heating with high-tension single-phase and two-phase oscillatory discharge, and the principle of an arrangement called the "focus inductor." An artificially cooled inductor furnace is described and shown diagrammatically in cross-section. With this furnace, a temp. of 1800° or over can be maintained by applying a high-frequency e. m. f. (10,000 cycles or more) to the primary of the transformer, and the melt of ferrous metals or their alloys can be preserved free from C or undesired elements. It is believed that the most important application of high-frequency induction for heat treatment of materials at high temps. is the production of C-free melts, very rapid heating and excessively high temps. The quantities of materials which can be handled in this manner appear only to depend upon the power available with currents which exceed 10,000 cycles in frequency. With this new method of heating, batches of several kgs. of such materials as Pyrex glass, pure Ni and pure Fe have been rapidly melted in air and in vacuum, and Pt has recently been melted without the presence of C. The large expense of the condensers required, which are only active in the oscillatory current method from one-fifth to one-sixth of the time, the rather low power factor connected with this system and the high voltages necessary for generating the oscillations, would seem to limit this method of obtaining high-frequency currents to single power units of the order of magnitude of 100 kw. (Cf. C. A. 12, 242.)

H. JERMAIN CREIGHTON.

Production and distribution of electric-furnace products. ANON. *J. four élec.* 28, 25(1919).—A general discussion of the economics of elec.-furnace products, especially as regards the situation developed by the war and the future of these products in the light of resources in the different countries. In France, the majority of the electrochem. plants are complete units, having their own hydro-elec. installations. In Switzerland, a similar situation exists, with, however, most plants being lessors. In Italy, a situation similar to that in France and Switzerland, excepting a multitude of small elec. plants which rent current for the most part from the city distributing system. In Spain, as in France, but the carbide industry has not developed much. In England, excepting the aluminum industry, which used hydro-electric power, all other plants use current derived from steam-elec. central stations. In Sweden all the factories, both electrochem. and electrometallurgical, must obtain their current from large hydro-elec. plants established by the government. In Norway, in general, factories do not own hydro-elec. installations and they obtain current on long contracts from private stations. In U. S., most electrochem. plants have no water power; they obtain power from hydro-elec. concerns; this is especially the case at Niagara Falls. In other localities a sepn. between producer and consumer is preferred. The great elec. steel works are supplied by steam elec. stations. In Canada the situation is similar to that of the U. S., notably at Shawinigan Falls. All the current in the country is of hydro-elec. origin. From the point of view of international competition, the conditions in France and Switzerland are most favorable. Next come the Scandinavian countries, and lastly England and U. S., where cost of current is much higher than in Europe. F. W. ZONS.

The use of aluminum in the electrical industry. JULES GARÇON. *Bull. soc. encour. ind. nat.* 131, 155-80(1919).—An account of the increasing use of Al to replace Cu in elec. work for conductors and in elec. machines. Pure materials and careful control of the electrolytic bath in the production of Al to insure a pure metal are of great importance. The poor success attending the early use of Al conductors was due to the impurity of the Al and its lack of homogeneity. The usual impurities, Fe, Si, C, O and Na, should not together exceed 1.00 or 1.25% and the last two, especially Na, should be present only in traces. Al used for elec. purposes in England has usually not over 0.75% total impurities and an elec. cond. at 15° of 60% that of standard hard drawn Cu. Of Al alloys, only duralumin (Al-Cu-Mg) is important for elec. use.

In heat-treated condition it has a hardness and mechanical strength more than twice that of pure Al. The physical and mechanical, and the elec. properties of Al and Cu are compared.

LOUIS JORDAN.

Some remarks regarding the quality of calcium carbide. ANON. *Bull. soc. suisse acétylène*; *J. four. élec.* 28, 38-40(1919).—It is pointed out that the cost of  $\text{CaC}_2$  should be based upon the amt. of available  $\text{C}_2\text{H}_2$ . Carbides of various qualities are discussed. Those of superior quality often cause during decomposition an abnormal heating of the app., which produces sudden high pressures endangering the app., and which results in polymerization of part of the  $\text{C}_2\text{H}_2$  to tarry products,  $\text{C}_6\text{H}_6$ , and styrene, thus lowering the yield and obstructing the conduits and jets. It is suggested that the cause of this phenomenon is related to the phys. constitution of the  $\text{CaC}_2$  and to its porosity. In the case of a porous carbide, decompn. occurs not only on its surface but also in its interior, where the temp. rapidly rises to that necessary for the polymerization of  $\text{C}_2\text{H}_2$ . Since this polymerization is exothermic, more heat is furnished and a further quantity of the gas is polymerized, and so on. The extent to which abnormal heating and polymerization occur varies with the type of  $\text{C}_2\text{H}_2$  generator employed, and depends upon the rate at which the heat is dissipated. With carbides of poor quality, irregularities are produced in the generating app. H. J. CREIGHTON.

Gas warfare and the development of Edgewood Arsenal (chlorine). WM. H. WALKER. *Trans. Am. Electrochem. Soc.* 35, preprint; *Manufact. Record* 75, 95-6(1919).—An address. C. G. F.

Electrolytic process for the production of sodium permanganate from ferromanganese. R. E. WILSON AND W. G. HORSCH. *Trans. Am. Electrochem. Soc.* 35 (preprint).—A description of lab. expts., followed by semi-plant scale operation, wherein ferromanganese anodes were employed in a diaphragm cell containing a soln. of  $\text{Na}_2\text{CO}_3$  as the anolyte. It has been found that the current efficiency rises rapidly at first with increasing c. d., and then less rapidly after a c. d. of 7-9 amp./ $\text{dc}m^2$  has been attained. The current efficiency decreases rather rapidly with increase in temp., but this is somewhat offset by the decrease in voltage. The minimum energy consumption occurs at about  $30^\circ$ , although there is but slight variation between  $20^\circ$  and  $30^\circ$ . The commercial type of cell contains 2 compartments and has an effective diaphragm surface of  $6400\text{ cm}^2$ . The anode consists of 5 mechanically sound, cast ferro-Mn bars having the dimensions  $13 \times 4 \times 90\text{ cm}$ . With this cell a current efficiency of 35%, a cell v. of 7.0 and an energy consumption of 26.5 kw. hrs. per kg. of  $\text{NaMnO}_4$  have been obtained. If the concn. of permanganate in the anolyte is carried above 8%, the current efficiency drops and the anodes require to be changed more frequently. Runs at a c. d. of 13 amp./ $\text{dc}m^2$  demonstrate that the high yield per cell per day more than offsets the small increase in cost due to increased energy consumption, and that the cell may easily be kept cool at this c. d. It has been found preferable and entirely practical to operate at an av. temp. of about  $20^\circ$ . Details of design, costs and operating expenses, are given for a plant producing 0.5 ton of  $\text{NaMnO}_4$  per day. It has been estd. that  $\text{NaMnO}_4$  could be produced under war conditions at about 60 cents per lb.

H. JERMAIN CREIGHTON.

Electrolysis of fused sodium and potassium amides. L. WÖHLER AND FR. STANG-LUND. *Z. Elektrochem.* 24, 261-70(1918).— $\text{NaNH}_2$  is of technical importance in the synthesis of indigo dyes, and as an intermediate product in the prepn. of cyanides. The previously accepted m. p. (Titherley) was  $149-55^\circ$  for  $\text{NaNH}_2$  and  $270-2^\circ$  for  $\text{KNH}_2$ , while the authors find  $\text{NaNH}_2$  m.  $210^\circ$  and  $\text{KNH}_2$  m.  $338^\circ$ . The great reactive tendency of alkali amides makes them available for the prepn. of hydrazine, as made by Raschig.  $\text{N}_2\text{O}$  acts rapidly on  $\text{NaNH}_2$  at  $190^\circ$ .  $\text{Cl}_2$  under  $\text{C}_2\text{H}_2$  or  $\text{CCl}_4$  gives chlor-



amine and much  $\text{NCl}_3$ . Similarly,  $\text{I}_2$  gives black cryst.  $\text{NI}_3$  and  $\text{NH}_4\text{I}$ .  $\text{SO}_2$  acts on finely pulverized  $\text{NaNH}_2$  on warming, and on fused amide it gives  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ , and polysulfide, but not hydrazine.  $\text{P}_2\text{O}_5$  on molten  $\text{NaNH}_2$  gives  $\text{PH}_3$ .  $\text{Hg}$  alone does not act on molten  $\text{NaNH}_2$ . Although Davy found  $\text{KNH}_2$  a non-conductor, nothing is known about the cond. of amides. Franklin and Kraus (*Ann.* 23, 277) found a soln. of  $\text{NaNH}_2$  (0.14%) in liquid  $\text{NH}_3$  to have 45 times the resistance of an equiv. aq. soln. of  $\text{NaOH}$ . At the m. p. the explosive hydrazide mentioned by Stolle (*J. prakt. Chem.* [2] 83, 200(1911)) is not formed.  $\text{NaNH}_2$  reacts catalytically on hydrazine, even at room temp. The  $\text{NH}_3$  from the initial product in turn breaks up:  $3\text{N}_2\text{H}_4 = 4\text{NH}_3 + \text{N}_2$ . A stream of inert gas satd. with hydrazine on passing over molten  $\text{NaNH}_2$  gave  $\text{NH}_3$ . The electrolysis of the melt was quantitatively studied and the investigation of the gases evolved showed the reaction  $6\text{NH}_2' + 6\oplus = \text{N}_2 + 4\text{NH}_3$ . No other products were found. The cond. and decompn. v. of the fused amides were detd. An app. was designed in which abs. pure Na and K amides were made, and their physical properties immediately investigated. By use of a cooling curve of the amides the m. p. was detd. more exactly than heretofore, with results above mentioned. No other stopping points were observed on the m.-p. curve above the m. p. The  $\text{NaNH}_2$  is white, cryst. and becomes colorless at the m. p. At higher temps. it assumes a greenish blue color, which becomes more intense with increasing temp.  $\text{KNH}_2$  is a waxy, white cryst. material, similar to  $\text{NaNH}_2$ . Both slightly attack glass. The temp. was measured by a Ag-Ni element, which is not acted upon chem. by the melt, and which shows a comparatively high e. m. f. at  $200^\circ$  (at  $40^\circ > 1$  millivolt). Analysis of the melt immediately after m.-p. detn. showed 40.93%  $\text{NH}_3$  (theoretical 41.1%). In the residue, however, Na = 60.00%, instead of theoretical 58.9%, due to the distg. flask being attacked in driving off  $\text{NH}_3$ . For  $\text{KNH}_2$ , similarly, the analysis showed 28.8%  $\text{NH}_3$  (theoretical 29.67%) and in the residue again a little more alkali (71.5%) instead of the calcd. 70.93%. The authors found (as also Dennis and Brown) that only Ni and Fe were sufficiently resistant at  $220^\circ$  for the study of anode gases. The  $\text{N}_2$  at the temp. investigated showed no measurable quantity of  $\text{H}_2$ , which verifies the assumption that the  $\text{NaNH}_2$  breaks up into Na and  $\text{NH}_2$  ions. The lack of other gases evolved contradicts suggested possibilities. A Cu voltameter gave results in accord with the equation  $6\text{NH}_2' + 6\oplus = 4\text{NH}_3 + \text{N}_2$ . The Na or K ion and the presence of  $\text{NH}_2$  was verified. No other ions were identified. In using alc. in the analysis of the amide by decompn. with  $\text{H}_2\text{O}$ , the authors claim to have improved on the method of Dennis and Brown (*Z. anorg. Chem.* 40, 93(1904)). The conds. of the amides were found for  $\text{NaNH}_2$ ,  $\chi_{210}^\circ = 0.593$  mhos,  $\text{KNH}_2$ ,  $\chi_{210}^\circ = 0.389$  mhos. The decompn. voltages were found to be  $\text{NaNH}_2$ ,  $E_{210}^\circ = 0.71$  v., with a temp. coeff.  $1.52 \times 10^{-3}$ , and for  $\text{KNH}_2$ ,  $E_{210}^\circ = 0.87$  v.

F. W. ZONS.

The function of barium sulfate in accumulators. O. SCARPA. *Elettrotecnica* 5, 371-2(1918); *Science Abstracts* 21B, 429.—Some large batteries of accumulators after 100 discharges showed only 40% of their initial capacity. This capacity should have remained const. for at least 200 discharges. S. attributes this loss to the physical properties of the  $\text{BaSO}_4$  mixed with the Pb oxides of the negative plate in order to make the mass more porous. The  $\text{BaSO}_4$  used was made in Italy. Its chem. properties were the same as the sulfate of German origin, which was used before the war, but its physical properties were different. Microscopic observations showed that the function of the  $\text{BaSO}_4$  was to prevent the cementing of the Pb particles to one another, transforming the soft Pb to hard Pb.

LOUIS JORDAN.

The chemistry of the action of the lead accumulator. CHARLES FÉRY. *Bull. soc. encour. ind. nat.* 431, 92-8(1919); cf. *C. A.* 12, 565.—Gladstone and Tribe regarded the active material of the + plate of a charged accumulator as  $\text{PbO}_2$  and that of the

negative plate as spongy Pb, both changing to  $\text{PbSO}_4$  on the discharge. Exptl. evidence is given to show that the + active material is not  $\text{PbO}_2$ , having neither its physical nor chemical properties, but is a higher oxide analyzing as  $\text{Pb}_2\text{O}_3$ . The discharge negative material is a sub-sulfate of Pb ( $\text{Pb}_2\text{SO}_4$ ). The mechanism of discharge at the negative plate is  $2\text{Pb} + \text{H}_2\text{SO}_4 = \text{Pb}_2\text{SO}_4 + \text{H}_2$ ; at the positive plate  $\text{PbO}_2 + \text{H}_2 = 2\text{PbO} + \text{H}_2\text{O}$ . The lower sulfate of Pb is very easily oxidized and in the air changes readily to the normal white  $\text{PbSO}_4$ .  
LOUIS JORDAN.

Weston normal cell comparisons. J. OBLATA. *Electrotechn. Lab., Tōkyō. Researches* 70, 1-11, May, 1918; *Science Abstracts* 21A, 388-9; cf. *C. A.* 12, 2478.—The first comparisons between the standards of e. m. f. of the Electrotechn. Lab. of Japan, of those of the National Physical Laboratory, England, and of the Bureau of Standards were made in 1914 by means of 4 cells of the English and 2 of the American institutions. In 1916 and 1917 other series of comparisons were made. It is highly probable that on all three occasions the standards of e. m. f. of the three institutions agreed within 1 part in 100,000.  
H. JERMAIN CREIGHTON.

Lead plating of shell interiors and boosters. A. G. REEVE. *Trans. Am. Electrochem. Soc.* 35, Preprint.—A detailed description of the app. and process utilized in Pb electroplating gas-shell interiors and boosters. After thorough cleaning, the shells were filled with a hot Cu "striking" soln. of the following compn.: Basic copper carbonate 225 g., NaCN 960 g., water 3.8 l. The Pb was deposited from fluoborate or fluosilicate bath. Cathode surface was five times anode surface and the quantity of bath small in proportion to the vol. of metal deposited. Thin, flat cast anodes had the widest part near the center and were 13 mm. wide at the top. A thin paddle, as wide as the shell opening would take, was used as stirrer. Rotating the anode and stirrer compensated for insufficient anode area. Current reached the spindles through babitt bearings set in woodwork and the spindles were divided into four batteries and connected in series with 6-v. plating current. The 13 spindles of each battery were connected in multiple. The fluosilicate bath contained: Pb 18.02%,  $\text{H}_2\text{SiF}_6$  14.14%,  $\text{H}_2\text{SiF}_6$  (free) 2.90%, and glue 0.4%. The thickness of plating was judged by dropping a 9 mm. steel ball through a perpendicular glass tube, 1.8 m. long, with the lower end resting upon the bottom of the shell. Pin holes were detected by means of the ferroxyl test. Boosters were plated as rotating cathodes on the shell-plating spindles. Light rejected shells were weighted in a manner similar to the lining of gas shells except that Ag was substituted for the Cu "strike."  
W. H. BOYNTON.

Physical phenomena accompanying cathodic deposition of metals (nickel). V. KORN-SCHUETTER AND E. VUILLEUMIER. *Z. Elektrochem.* 24, 300-21 (1918).—A Pt electrode  $20 \times 65 \times 0.1$  mm. and another  $0.05$  mm. thick is used in the observations recorded. The electrode is fastened at the upper end, and has a glass indicator which passes over a mm. scale, at the lower end. One side of the cathode (away from anode) is insulated with a copal varnish or vaseline. The authors call the app. a "contractometer." A soln. of  $\text{NiCl}_2$  is chosen, as Ni gives a most marked and characteristic effect. On electrolysis the cathode bends towards the anode (Ni). The extent of the bending was studied under various conditions. The bending increased with time. Cu, Ag and Fe solns. were used to show that the behavior was not characteristic of the app. but is related to the deposit. Of the solns. tried, that of  $\text{KAg}(\text{CN})_2$  showed least deflection, and  $\text{FeSO}_4$  soln. the greatest deflection for the same time. Increased concn. of  $\text{CH}_3\text{COOH}$  decreases the deflection, and HCl does so to greater extent. Small additions of  $\text{Fe}^{++}$  cause considerable increase while small amts. of  $\text{Zn}^{++}$  decrease the deflection. Indifferent salts ( $\text{Na}^+$ ,  $\text{Mg}^{++}$ , etc.) cause increased deflection as do also such org. substances as sugar, alc. and gelatin. In ammoniacal solns. high concn. results in smaller deflections. On cathodes only slightly deflected in these solns. the metal strips off.

A rapid deflection is characteristic at certain points, and occurs sooner when the c. d. is higher. In HCl soln. with increase of temp. an abrupt change takes place at  $0^\circ$  and at  $60^\circ$ , and on reversal of current a similar change is noted. The decompn. potential was found to be 1.7 v. The above results indicate two successive actions on the cathode, the fixing of a dispersed form of Ni film on the electrode, and then the formation of a layer which is associated with a surface contraction. The upper layer having more energy the two extreme conditions may be represented by  $(\text{Ni})_I$  and  $(\text{Ni})_{II}$ , in Nernst's formula  $P_I > P_{II}$ ,  $E_I = RT/2F \ln P_I/P > E_{II} = RT/2F \ln P_{II}/P$ . The difference corresponds to a difference in energy between the states of division of Ni. The results, therefore, appear characteristic of a condition of electrolysis, and not of Ni, although the latter shows it to a marked degree. The authors give a detailed explanation of the actions taking place at the cathode, which involves the chemical sepn. of  $\text{H}_2$  from discharged ions (atoms) and the physical escape of the gaseous  $\text{H}_2$ . In solns. which do not involve  $\text{H}_2$ , the bending is less. So also when the deposit is granular. The cathode is represented as a condenser on which a thin film of  $\text{H}_2$  deposits, which is pressed against the electrode by the electrical field. This film is thus between the electrode and ions in soln. As the film grows, the discharged ions are being deposited, and these closely attracted particles are sepd. by the growing film, the internal pressure of which is increasing. With the simultaneous sepn. of metal which is deposited in the film the latter, because of the pressure exerted, has the behavior of a viscous fluid. In the gaseous medium the Ni is condensed from ionic state as dispersed metal, and in the film also occurs a decrease in dispersion, which becomes apparent in the contraction of the deposit and consequent bending of the electrode. Curves representing the results are given. F. W. ZONS.

**Electroplating of iron from copper sulfate solution.** O. P. WARRS. *Trans. Am. Electrochem. Soc.* 35, Preprint.—W. discusses the use of As, Sb, Bi, Pb and Sn dipping solns. to insure good subsequent electroplating of Cu on Fe. Ni was not tried because of its proximity to Fe electrochemically. The As dip worked with HCl or  $\text{H}_2\text{SO}_4$  as solvent for  $\text{As}_2\text{O}_3$ , the Pb fluosilicate dip acted more slowly, while solns. of  $\text{Pb}(\text{NO}_3)_2$  and  $(\text{AcO})_2\text{Pb}$  acidified with  $\text{HNO}_3$  and  $\text{AcOH}$ , resp., caused the Cu plate to rub off easily, probably due to the cryst. Pb deposit. A very concd. soln. of  $\text{MgCl}_2$ , acid with HCl, as solvent for  $\text{SbCl}_3$  was used to prevent a black, spongy deposit of Sb on Fe. This dip requires a more strongly acid Cu-plating bath. Bi and Sn dips are unsatisfactory. Bi was successfully plated on Fe by aid of the As dip, but its brittleness precludes its general use in plating. The successful substitution of solns. of Sb and Pb for As and the application to plating on Fe with Bi show that the beneficial effect of the As dip is the result of coating the Fe with a metal whose potential in acid soln. is so near to that of Cu that it is possible to deposit a good Cu plate upon it, yet whose potential is not so far below that of Fe that it will deposit on Fe in powdery non-adherent form. W. H. BOYNTON.

**Building a cyanide copper-plating solution.** R. E. PETERS. *Metal Ind.* 17, 128-9 (1919).—After considerable exptl. work on Cu-plating solns. the following bath proved best:  $\text{Cu}(\text{CN})_2$ , 7 oz. (198.5 g.);  $\text{NaCN}$ , 9 oz. (255 g.); soda ash, 2 oz. (56.7 g.). Water 1 gal. (3.79 l.). Plating was conducted at  $77-82^\circ$ , using 3-4 v. at about 15 amp. per sq. ft. (1.62 amp. per sq. dm.). Daily the free cyanide was detd. and the necessary amts. of  $\text{Cu}(\text{CN})_2$  and  $\text{NaCN}$  to dissolve it were added. W. H. BOYNTON.

**Remarkable pitting in electroplating.** O. P. WARRS. *Trans. Am. Electrochem. Soc.* 35, Preprint.—After Pb plating for some time, heavy pitting developed which proved to be due to air dissolving in the electrolyte while not in use, and which was expelled as minute air bubbles on the work when the bath was heated by the passage

of the current. Pitting resulted only when evolution of gas from the work was extremely slow.

W. H. BOYNTON.

**Relative volatilities of refractory materials.** W. R. MOTT. *Trans. Am. Electrochem. Soc.* 34, Preprint.—A study of the order in which refractory materials volatilize in the elec. arc, and the distances at which their vapors condense from the arc. Ten arc methods for obtaining the relative volatilities of metals, carbides, oxides, nitrides, fluorides, chlorides and sulfides are suggested and partially developed. The following b. ps. have been estd. on a triple basis of reference to the curves with Fe for equal (atomic) amounts of materials, fractional distn. series and position of deposition at the negative crater; Fe satd. with C, 3,500°; SiO<sub>2</sub>, 3,500°; Pd, 3,600°; C, 3,700°; Al<sub>2</sub>O<sub>3</sub>, 3,700°; chromium carbide, 3,800°; vanadium carbide, 3,900°; Rh, 4,000°; Pt, 4,050°; uranium carbide, 4,100°; Ru, 4,150°; La<sub>2</sub>O<sub>3</sub>, 4,200°; titanium carbide, 4,300°; Yt<sub>2</sub>O<sub>3</sub>, 4,300°; columbium carbide, 4,300°; ZrO<sub>2</sub>, 4,300°; ThO<sub>2</sub>, 4,400°; Ir, 4,400°; Os, 4,450°; molybdenum carbide, 4,500°; yttrium carbide, 4,600°; thorium carbide, 5,000°; zirconium carbide, 5,100°; Ta (carbide?), 5,500°; and W (carbide?), 6,000°. The metals in this series were satd. with C, which would tend to raise the b. p. The volatility of the oxides investigated takes the following approx. order: K<sub>2</sub>O, Na<sub>2</sub>O, Li<sub>2</sub>O, V<sub>2</sub>O<sub>5</sub>, B<sub>2</sub>O<sub>3</sub>, BaO, SrO, MnO, FeO, CoO, NiO, Cr<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, V<sub>2</sub>O<sub>4</sub>, SiO<sub>2</sub>, CaO, MgO, (xCaO.ySiO<sub>2</sub>), (xBaO.yAl<sub>2</sub>O<sub>3</sub>), Al<sub>2</sub>O<sub>3</sub>, Ti<sub>2</sub>O<sub>3</sub>, V<sub>2</sub>O<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub>, CeO<sub>2</sub>, Nd<sub>2</sub>O<sub>3</sub>, La<sub>2</sub>O<sub>3</sub>, BeO, Yt<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, ThO<sub>2</sub>. BN sublimates at near 3000°. A number of theoretical considerations are advanced concerning the ratios of abs. b. ps. to m. ps., and upon a universal vapor-pressure curve applicable to all substances. The value of the ratio is 1.8 for all elements except the alkali metals for which the value is 3.3. In conclusion, a short bibliography of the subject is given.

H. JERMAIN CREIGHTON.

**A new vacuum tube for wireless.** IRVING LANGMUIR. *Wireless Age* 6, 15-6(1919).—Three circuits are illustrated and explained by the beat phenomenon. One shows the plate circuit of the vacuum tube coupled to the alternator, another has the cascade amplifier, and the third has the radio frequency alternator coupled directly to the antenna.

W. H. BOYNTON.

How the nitrogen problem has been solved (GREIGHTON) 18. Determination of the temperature of the electrodes of the arc (HAGENBACH, LANGBEIN) 2. Substitutes for platinum in electrolytic apparatus (NICOLARDOT, BOUDET) 1. Synthesis of ammonia at high temperatures (MAXTED) 6. Accurate timing in electrical tests (KARTAK) 1. Laboratory furnaces (ANON.) 1.

**Storage battery construction.** WM. MORRISON. *Can.* 189,797, Apr. 22, 1919. The battery comprizes a case, battery plates therein, cooperating means on said case and plates for supporting the plates and preventing sidewise movement thereof, a cover, means for securing the cover to the case, connectors secured to the plates and comprizing cooperating clamping parts engaging the upper and lower surfaces of the cover, means for clamping the parts together and means for sealing the parts between the cover and connectors.

**Storage-battery grid.** E. HANDLER. U. S. 1,293,419, Feb. 4. Structural features.

**Connectors for storage batteries.** WM. MORRISON. *Can.* 189,796, Apr. 22, 1919. The connector comprizes a plate member having a cavity therein, a wedge member having a wedge portion fitting into the cavity, means for sealing the point between the wedge member and the top of the plate member, a wedging member within said wedge portion and a headed screw bolt extending through the wedge member and

into screw threaded engagement with the wedging member and means for sealing the point between the head of the bolt and the wedge member.

**Storage battery electrodes and filling mass therefor.** WM. MORRISON. Can. 189,798, Apr. 22, 1919.  $\text{H}_2\text{SO}_4$  and  $\text{PbO}$  are mixed under conditions to initiate an energetic reaction and to produce a non-acid stable filling mass which is transferred to a grid or support and subjected to sufficient pressure to initiate the setting of the mass and the plate is formed electrolytically before the filling mass has attained its maximum hardness. Cf. C. A. 13, 94.

**Arc-welding electrode.** C. V. ELLIOTT. U. S. 1,294,250, Feb. 11. Arc-welding ferrous metal electrodes are coated with a very thin layer of  $\text{Ca(OH)}_2$  by dipping them in milk of lime and drying. Electrodes thus prepd. operate with a smooth-flowing quiet arc and deposit welding metal evenly without the disadvantage of including melted flux within the deposited metal such as may occur when a relatively thick sheath of fluxing material is used on the electrode. Similar results are secured by using, instead of  $\text{Ca(OH)}_2$ , other hydroxides, fluorides, chlorides, carbonates, silicates or sulfates of Ca, Ba, Sr, Mg, Na, K or Li.

**Manganese peroxide for use as a depolarizer.** M. L. KAPLAN. U. S. 1,293,461, Feb. 4. Artificial  $\text{MnO}_2$  suitable for use as a depolarizing material in dry-cell batteries is prepd. in the following manner:  $\text{MnCO}_3$  heated to  $300^\circ$  is exposed to the action of hot air for several hrs. to obtain a product containing over 70%  $\text{MnO}_2$ . After cooling, this product is moistened with 10-20%  $\text{HNO}_3$  and the moist mixt. is gradually heated first to drive off  $\text{H}_2\text{O}$  and excess acid and then to decompose the  $\text{Mn(NO}_3)_2$  formed without decomposing other nitrates present as impurities which remain undecomposed unless heated to higher temps. than that required to decompose  $\text{Mn(NO}_3)_2$ . The  $\text{MnO}_2$  is freed from nitrates of metals other than Mn by treatment with  $\text{H}_2\text{O}$  and there is thus obtained a residue, which, after drying, is a fine, dense, gray-colored powder closely resembling the powdered mineral  $\text{MnO}_2$  but superior to the latter in purity and in depolarizing action. Oxides of N may be mixed with the air used for treating the  $\text{MnCO}_3$  to shorten the time and reduce the temp. required.

**Depolarizing material for dry-cell batteries.** M. L. KAPLAN. U. S. 1,293,462, Feb. 4. The pat. relates to the manuf. of an efficient depolarizing material from  $\text{MnO}_2$  compds. containing various basic impurities such as are known as "recovered manganese." The material is treated with sufficient  $\text{HNO}_3$  to form nitrates of all the metals present and the mass thus obtained is treated in the same manner as the nitrate mixt. in the process of U. S. pat. 1,293,461 (*supra*). The conducting material to be used with the depolarizer may be incorporated before the treatment with  $\text{HNO}_3$ .

**Depolarizer material from natural manganese dioxide.** A. A. WELLS. U. S. 1,293,272, Feb. 4. Natural  $\text{MnO}_2$  such as a medium or good grade of pyrolusite is mixed with charcoal or coke and the mixt. is heated in an elec. furnace to form  $\text{Mn}_2\text{C}$ . The latter is then reacted upon by  $\text{H}_2\text{O}$  to form  $(\text{MnO}_2\text{H}_2)_2$  in light flocculent form, which is sepd. from Fe compds. and other impurities by flotation and washing with a stream of  $\text{H}_2\text{O}$ . The hydrate thus sepd. is then oxidized by the action of ozonized air or by heating to  $150$ - $250^\circ$  in a current of moist air, forming  $\text{Mn}_2\text{O}_8$ , which is suitable for use with graphite as a depolarizing material in dry batteries.

**Electrolytic tungsten.** F. G. KEYES. U. S. 1,293,117, Feb. 4. Pure metallic W is obtained by dissolving W in boric acid at a temp. of  $1200$ - $1400^\circ$  and electrolyzing the soln. thus formed.

**Metals for filament manufacture.** A. PACZ. Can. 188,740, Feb. 18, 1919. Filaments substantially free from offsetting after continued use and containing no crystn.-retarding material attributable to the addition of material for this purpose during the

prepn. are made by mixing salts having substantially the same chem. compn. but differing in their mode of prepn. so that they have different mol. structures, agglomerating the mixt. and mechanically working the body so produced.

**Treating gases and vapors electrically.** W. T. HOOFNAGLE. Can. 189,634, Apr. 15, 1919. A field having intermittent electrical discharges of short duration and high current density is maintained between electrodes in a closed chamber and gases to be treated are passed through the field at a pressure below atm. and at a speed proportioned to the periodicity of the discharges. App. is specified.

**Uniting tungsten filaments with nickel wires.** M. A. HOYT. U. S. 1,293,781, Feb. 11. W filaments of incandescent elec. lamps are united with Ni leading-in wires by pressing the filament and wire together and heating the joint by passing an elec. current through it.

**Tungsten filaments.** F. G. KEYS. U. S. 1,293,116, Feb. 4. W filaments for incandescent lamps are prepd. by depositing W electrolytically upon a fine W wire and hot-drawing the wire through dies of W-Fe-C alloy lubricated with powdered talc.

**Electric arc furnace for metallurgical uses.** W. E. MOORE. U. S. 1,293,164, Feb. 4.

**Electric arc furnace adapted for heating retorts or cupels.** I. RENNERFELT. U. S. 1,294,830, Feb. 18.

**Electric arc furnace adapted for melting brass.** F. VON SCHLUBERL and C. B. FLETCHER. U. S. 1,294,837, Feb. 18.

**Hooks for electroplating.** O. RONDZL. Can. 189,817, Apr. 22, 1919. Structural features.

**Selenium bridges.** F. C. BROWN. Can. 189,334, Mar. 25, 1919. A bridge is made from a Se crystal or crystals formed by freeing Se from occluded gases, vaporizing in vacuum and causing the deposition of crystals from the Se vapor. The crystals may be made to absorb one or more gases.

**Purifying aluminous materials.** O. HUTCHINS. Can. 190,031, Apr. 29, 1919. Aluminous material is fused with C insufficient in amt. to reduce all the  $Fe_2O_3$ ,  $TiO_2$  and  $SiO_2$  contained therein, the material is sepd. from the reduced impurities and again fused with sufficient C to produce an abrasive containing at least 97% of  $Al_2O_3$ .

## 6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

**Inorganic complexes.** JOSE R. MOURELO. *Rev. sci.* 57, 65-72(1919).—A review and appreciation of the theories of Werner regarding the formation of complexes, such as auxiliary valence, the coördination number and the explanation of isomerism of hydration, of stereoisomerism, and of metamerism of ionization. The author admits the rigidity of Werner's system, but otherwise is in hearty accord. G. L. CLARK.

**Transformation and oxidation of chromic hydroxide in alkaline solution.** F. BOURION and A. SENECHAL. *Compt. rend.* 168, 59-62(1919); cf. C. A. 8, 1069.—Alk. solns. of  $Cr(OH)_3$  undergo a transformation with time by which they lose chem. activity, particularly their reducing power toward  $H_2O_2$ . The rate of change is more rapid as the concn. of Cr increases and the concn. of NaOH decreases. A soln. of 0.938 g.  $Cr_2O_3$  and 0.294 mol. NaOH per l. when stirred for 2 min. with 5-fold the calcd. quantity of  $H_2O_2$  was 81.8% oxidized when the alk. chromite had stood 5 min., 54.4% after 30 min., 12.7% after 6 hrs., and 2.6% after 51.5 hrs. A. R. M.

**Solubility of cupric hydroxide in sodium and potassium hydroxides of sufficient concentration.** E. JUSTIN-MUELLER. *Compt. rend.* 167, 779-80(1918).—NaOH (d. 1.345-1.370) and KOH (d. 1.453-1.498) dissolve 0.78 g.  $\text{Cu}(\text{OH})_2$  per 100 cc. The solns. are perfectly stable and do not change upon heating even after large diln. Soln. is incomplete in less concd. lyes or if the proportion of Cu is increased.

A. R. MIDDLETON.

**The cycle of oxidation of nitric oxide in presence of water.** A. SANFOURCHE. *Compt. rend.* 168, 401-4(1919).—Mixts. of NO with large excess of air ( $\text{NO}:\text{O}_2 = 1:1$ ) with time of contact sufficient to transform 95% of the NO to  $\text{N}_2\text{O}_4$  at  $50^\circ$  were found to contain about 92% of the NO as  $\text{N}_2\text{O}_3$  and 8% as  $\text{N}_2\text{O}_4$ . In contact with mixts. of water and  $\text{HNO}_3$  these proportions were scarcely changed until the acid reached a concn. of 47.5% (33.5° Bé.) when 69% was transformed to  $\text{N}_2\text{O}_3$  and 31% to  $\text{N}_2\text{O}_4$ . With 62% acid (40° Bé.) about the same proportions were transformed but with 94% acid (48° Bé.) 2.8% was transformed to  $\text{N}_2\text{O}_3$  and 97.2% to  $\text{N}_2\text{O}_4$ . S. concludes that  $\text{N}_2\text{O}_3$  is the chief intermediate product, being decompd. according to  $3\text{N}_2\text{O}_3 + \text{H}_2\text{O} = 2\text{HNO}_3 + 4\text{NO}$ , involving a cycle in which  $\frac{2}{3}$  of the NO is periodically regenerated. The reversible oxidation of  $\text{N}_2\text{O}_3$  by  $\text{HNO}_3$  according to  $\text{N}_2\text{O}_3 + 2\text{HNO}_3 \rightleftharpoons 2\text{N}_2\text{O}_4 + \text{H}_2\text{O}$  and  $\text{N}_2\text{O}_4 + \text{H}_2\text{O} \rightleftharpoons \text{HNO}_3 + \text{HNO}_2$  conditions an equil. shown by these expts. to be reached at approx. 50% acid. In industrial practice the tower acid or that recovered in the columns varies little from this concn.

A. R. MIDDLETON.

**Constitution of nitrous vapors.** P. JOLIBOIS AND A. SANFOURCHE. *Compt. rend.* 168, 235-7(1919).—Mixts. of NO and air dried by a long column of  $\text{CaCl}_2$  were caused to circulate in an app. which permitted measurement of the time of contact; the proportion of  $\text{N}_2\text{O}_3$  to  $\text{NO}_2$  was detd. within 0.5% by bubbling the gas through concd.  $\text{H}_2\text{SO}_4$ , by which  $\text{N}_2\text{O}_3$  is transformed quant. to nitrosyl bisulfate while  $\text{NO}_2$  gives equal mols. of this and  $\text{HNO}_3$ ; NO is not absorbed. N was then detd. by nitrometer and a titration with  $\text{KMnO}_4$  completed the necessary data. Results show that with NO and air in proportion to form  $\text{N}_2\text{O}_3$  combination is instantaneous; after 100 secs. no  $\text{NO}_2$  formed, showing that  $\text{N}_2\text{O}_3$  does not dissociate under these conditions. With proportions to form  $\text{NO}_2$  combination to  $\text{N}_2\text{O}_3$  takes place at once; after 1 sec. no  $\text{NO}_2$  was detectable; after 20 sec. 34%, after 37 sec. 68%, after 100 sec. 92% was transformed to  $\text{NO}_2$ . With air in greater proportion or with pure  $\text{O}_2$  the times of transformation to  $\text{NO}_2$  were of the same order and, however prolonged the contact oxidation, did not proceed beyond  $\text{NO}_2$ . The gas mixt. was also passed through a quartz tube, the time of passage being 2 sec.; up to  $400^\circ$  the equil. tends toward  $\text{N}_2\text{O}_3$  with partial destruction of the nitrous vapors.

A. R. MIDDLETON.

**Carburization of ceric oxide.** A. DAMIENS. *Ann. chim.* 10, 330-52(1918); cf. C. A. 13, 542.—This work was undertaken to clear up various anomalies and contradictions in the literature. The following conclusions are reached: The oxycarbide of Sterba (*Compt. rend.* 134, 1056(1902)) to which he assigned the formula  $\text{CeC}_{2.2}\text{CeO}$ , is not a definite compd. The formation of  $\text{CeC}_2$  in the elec. furnace is preceded by the reactions  $2\text{CeO}_2 + \text{C} = \text{Ce}_2\text{O}_3 + \text{CO}$  and  $\text{Ce}_2\text{O}_3 + 9\text{C} = 2\text{CeC}_2 + 3\text{CO}$ . The intermediate products obtained by various investigators were solid solns. of  $\text{CeC}_2$  in  $\text{Ce}_2\text{O}_3$ .  $\text{CeC}_2$  can decomp. into  $\text{CeC}_2$  and graphite, which explains the invariable occurrence of graphite in incompletely reduced Ce oxides and the invariable failure to prep. carbides of Ce containing less than 4% of graphite.  $\text{CeC}_2$  is readily attacked by water with formation of  $\text{C}_2\text{H}_2$ , but when dissolved in small amts. in  $\text{Ce}_2\text{O}_3$  it is protected and only acids which dissolve the oxide can produce its complete decompn.

A. R. MIDDLETON.

**Potassium ammonosodiate, potassium ammonolithiate, rubidium ammonosodiate, and rubidium ammonolithiate.** E. C. FRANKLIN. *J. Phys. Chem.* 23, 36-53(1919);

cf. C. A. 9, 2851.—*Dipotassium ammonosodiate*,  $\text{NaKNH}_2 \cdot 2\text{NH}_3$  or  $\text{NaNH}_2 \cdot 2\text{KNH}_2$  or  $[\text{Na}(\text{NH}_2)_2]\text{K}$ , was prepd. in liquid  $\text{NH}_3$  by (1) action of  $\text{KNH}_2$  soln. on  $\text{NaNH}_2$ ; (2) addn. of  $\text{NaI}$  to excess of  $\text{KNH}_2$  soln.; (3) allowing a soln. of  $\text{Na}$  and excess of  $\text{KNH}_2$  to stand in contact with a small amt. of  $\text{Pt}$  black. The salt forms well developed crystals which which loose no  $\text{NH}_3$  at  $100^\circ$  in vacuum. It is decompd. by liquid- $\text{NH}_3$  solns. of acids and vigorously by water. *Rubidium ammonosodiate*,  $\text{NaNHRb} \cdot \text{NH}_3$  or  $\text{NaNH}_2 \cdot \text{RbNH}$  or  $[\text{Na}(\text{NH}_2)_2]\text{Rb}$ , was prepd. by the preceding method (3). It is similar in appearance and properties to the  $\text{K}$  compd. By evapn. to crystn. of the mother liquors which contained a large excess of  $\text{RbNH}_2$ , a product of different appearance from the mono- $\text{Rb}$  salt and distinctly more sol. was obtained. Analysis approxd.  $[\text{Na}(\text{NH}_2)_2] \cdot \text{Rb}$ . *Dipotassium ammonolithiate*,  $[\text{Li}(\text{NH}_2)_2]\text{K}$ , was obtained pure by methods (1) and (3). *Rubidium ammonolithiate*,  $[\text{Li}(\text{NH}_2)_2]\text{Rb}$ , was prepd. by method (3). All these salts are rapidly decompd. by water and by liquid- $\text{NH}_3$  solns. of acids. Attempts to obtain a definite compd. of  $\text{RbNH}_2$  and  $\text{KNH}_2$  were unsuccessful; cryst. products were obtained which appeared to be isomorphous mixts. of the 2 amides.

A. R. MIDDLETON.

Subacetate and subsulfate of lead. H. G. DENHAM. *J. Chem. Soc.* 115, 109-13 (1919); cf. C. A. 11, 1799; 12, 1951.—Preliminary expts. with  $\text{AcOMe}$  and  $\text{AcOEt}$  showed that at  $310^\circ$  the subacetate decomps. completely to  $\text{Pb}$  while at  $\text{AcOEt}$  much lower the reaction was too slow. Acetic anhydride gave good results. The app. and procedure were the same as previously employed. About 8 cc. of anhydride was distd. through the bulbs at  $195^\circ$ , the distn. lasting about 80-90 min. The oven was cooled to  $180^\circ$ , the app. was exhausted and the bulbs were sealed off for analysis. The subacetate usually contained 1-3% water, due probably to traces of  $\text{AcOH}$  in the anhydride. The ratio  $\text{Pb}:\text{C}_2\text{H}_3\text{O}_2$  agreed with theory. Some samples free from moisture were prepd. and showed no difference in soly. and properties from the hydrated samples. In 7 expts. with anhydride containing  $\text{AcOH}$  the av. was  $\text{Pb} = 75.8$ ;  $\text{C}_2\text{H}_3\text{O}_2 = 21.5$ .  $(\text{AcOPb})_2 \cdot \text{H}_2\text{O}$  contains  $\text{Pb} = 75.3\%$  and the products may have been this hydrate mixed with anhydrous salt. The cond. was compared with that of dehydrated normal acetate at  $25^\circ$  in abs.  $\text{EtOH}$ . The resistance of the  $\text{EtOH}$  was 90,000 ohms, satd. soln. of normal acetate 4100 ohms, of subacetate 6100, 6400, 6000 ohms. The behavior of the normal and of the subsalt when slowly heated *in vacuo* was entirely different. The subacetate, like the other sub-salts, is decompd. by acid into metal and normal salt. It is bluish gray. The subsulfate was prepd. by distn. of  $\text{Me}_2\text{SO}_4$  through the suboxide at  $280^\circ$  for 75 min. It is dark gray. Cond. expts. at  $18^\circ$  gave water 27,000 ohms, satd.  $\text{PbSO}_4$  3030 ohms, subsulfate 3100 ohms in air, 3200 ohms *in vacuo*. The small difference indicates decompn. into  $\text{Pb}$  and  $\text{PbSO}_4$  but no change in appearance of the residue was detectable. In  $\text{EtOH}$  resistance was 90,000 ohms, satd.  $\text{PbSO}_4$  93,000 ohms, satd. subsulfate 75,000 ohms. The subsulfate was heated  $120^\circ$  above the m. p. of  $\text{Pb}$  for 4 hrs.; no change whatever could be detected in the appearance of the salt and the microscope showed entire absence of anything in the nature of minute globules of  $\text{Pb}$ .

A. R. MIDDLETON.

Synthesis of ammonia at high temperatures. III. E. B. MAXTED. *J. Chem. Soc.* 115, 113-9 (1919); cf. C. A. 12, 2235.—The present paper deals with the formation of  $\text{NH}_3$  in an arc of larger size and more usual character than those previously employed. For the production of the arc 50-cycle a. c. at a max. p. d. of 375 v. was transformed by an oil-immersed static transformer having a step-up factor of 31.5. A sketch of the app. is given. It was found possible to obtain appreciable quantities of  $\text{NH}_3$  by almost any method by which mixts. of  $\text{N}_2$  and  $\text{H}_2$  were brought into the arc flame with subsequent rapid cooling, but for this preliminary study of max. percentage formed as distinguished from max. elec. efficiency, it was found preferable to let the arc



burn freely in the gas mixt. and to draw off samples by means of a quartz capillary placed close to the arc. The vol. concn. of  $\text{NH}_3$  increased with rate of flow to a max.; 0.49% at 0.5 liter/hr., 1.04% at 1.14 l./hr., 0.56% at 2.1 l./hr., 0.32% at 7.5 l./hr. For this series 0.04 amp. at 3250 v. was taken for arc formation. Additional evidence is presented that  $\text{NH}_3$  is formed by direct combination and not by reduction of NO due to  $\text{O}_2$  in the  $\text{N}_2$  used. The same vol. of  $\text{N}_2$  and  $\text{H}_2$  mixt. was passed repeatedly through a small arc,  $\text{NH}_3$  being absorbed by  $\text{H}_2\text{SO}_4$  at each passage. The data show practically uniform percentage of  $\text{NH}_3$  formed at each passage, even after more than 30 passages. M. believes this demonstrates beyond doubt the direct nature of the synthesis.

A. R. MIDDLETON.

**Interaction of stannous and arsenious chlorides.** R. C. DURRANT. *J. Chem. Soc.* 115, 134-43 (1919).—D. concludes from his own expts. confirming Bettendorf (*Ann.* 144, 110 (1867)) that the first deposit of As is of the yellow type but that this soon becomes brown or gray unless certain conditions not yet ascertained are fulfilled. The anhydrous chlorides do not react, but introduction of a trace of water causes much reaction. A study of the reaction velocity showed that it is accelerated chiefly by increase of the HCl concn., next by that of  $\text{AsCl}_3$  and least by that of  $\text{SnCl}_4$ .  $\text{AsCl}_3$  acts as a second power and  $\text{SnCl}_4$  to the square root of its concn. Chloride ions proceed partly from  $\text{AsCl}_3$  and partly from HCl and act as a first power. The data obtained are best accounted for by the hypothesis that the reaction is between chloride ions, arsenious ions and a complex,  $\text{H}_2\text{SnCl}_4$ . The reaction is of the first order and the slowest reactant is the complex. Essentially the reaction consists in the disintegration of the complex by circumambient ions.

A. R. MIDDLETON.

**Thiocyanates of gold and free thiocyanogen.** NIELS BJERRUM AND A. KIRSCHNER. *Kgl. Danske Videnskabernes Selskab.* [8] V, No. 1, 76 pp. (1918).— $\text{KAu}(\text{SCN})_4$ , prepd. according to Cleve (*J. prakt. Chem.* 94, 14 (1865)) had always too high Au (42.27-42.44; calcd. 42.08%) and too low K (8.02-8.16; calcd. 8.34). Similarly prepd. new salts,  $\text{NH}_4\text{Au}(\text{SCN})_4$ , orange, and  $\text{NaAu}(\text{SCN})_4$ , red cryst., approxd. more closely to the formulas. For the values of the sol. product consts. were calcd., K salt,  $6 \cdot 10^{-8}$  in an ion-normality of 1.4; N salt,  $5 \cdot 10^{-4}$  in 2.2 ion normal soln. and  $4 \cdot 10^{-4}$  in 0.6 normal soln. The soly. of the  $\text{NH}_4$  salt is about that of the K salt; that of the Ba salt (not analyzed) approx. that of the Na salt. The free acid  $\text{HAu}(\text{SCN})_4 \cdot 2\text{H}_2\text{O}$  was obtained by extg. with  $\text{Et}_2\text{O}$  a mixt. of 30 g.  $\text{NaSCN}$ , 200 cc. 1.5 M  $\text{H}_2\text{SO}_4$  and 100 cc. 10%  $\text{HAuCl}_4$ . 150 cc. ext. was dried with 15 g. anhydrous  $\text{Na}_2\text{SO}_4$  for 10 min. and evapd. *in vacuo*. Fine, dark red crystals were formed, stable in air but losing more than water over  $\text{H}_2\text{SO}_4$ . Aurous salts were prepd. by reducing acid solns. of auric salts with  $\text{Na}_2\text{SO}_3$  at ord. temp., extg. the colorless soln. with  $\text{Et}_2\text{O}$  and neutralizing the ext. with  $\text{KHCO}_3$  or  $\text{NH}_3$ . Both salts were pure white and analysis agreed closely with  $\text{KAu}(\text{SCN})_3$  and  $\text{NH}_4\text{Au}(\text{SCN})_3$ . Both are slowly decompd. by water. Cleve's method of prepn. by auto reduction gave impure straw-colored products. Upon extn. of acid solns. of these salts with  $\text{Et}_2\text{O}$  and washing the ext. with acid water to faint color of the latter with ferric salt, the  $\text{Et}_2\text{O}$  contained 2 SCN groups per Au atom, indicating  $\text{HAu}(\text{SCN})_2$  in soln. Evapn. of the  $\text{Et}_2\text{O}$  gave a reddish oil, the color of which deepened gradually, indicating a content of auric compd. The oil partially dissolved in  $\text{Et}_2\text{O}$  leaving a white, amorphous residue; both oil and residue dissolved in  $\text{NH}_3$ , giving pure, white  $\text{NH}_4\text{Au}(\text{SCN})_3$ . Upon dehydrating the  $\text{Et}_2\text{O}$  soln. of  $\text{HAu}(\text{SCN})_2$  with  $\text{Na}_2\text{SO}_4$  and satg. with  $\text{NH}_3$  Cleve's aminoaurorothiocyanate,  $\text{AuNH}_2\text{SCN}$ , was obtained in good yield. It is snow-white, darkens under exposure to light and is decompd. by water. It is easily sol. in  $\text{EtOH}$  containing  $\text{NH}_4\text{SCN}$ . The compn. and complexity of the  $\text{Au}(\text{SCN})_3$  ion was detd. by the method of Bodländer (*Z. phys. Chem.* 39, 607; *Z. anorg. Chem.*

31, 458(1902)) by measuring the p. d. between Au electrodes in two aurothiocyanate solns. in which the same  $[\text{SCN}^-]$  and different  $[\text{Au}^+]$  gives from the p. d. the no. of Au atoms in the complex and the same  $[\text{Au}^+]$  and different  $[\text{SCN}^-]$  gives from the p. d. the no. of  $\text{SCN}^-$  in the complex. For  $\text{Au}_m(\text{SCN}^-)_n$ ,  $n/m = E/1.983 \cdot 10^{-4} \cdot T \cdot \log(C_1/C_2)$ , where  $C_1$  and  $C_2$  are the concns. of  $\text{SCN}^-$  in solns. of the same  $[\text{Au}^+]$ ; and  $m = (1.983 \cdot 10^{-4} \cdot T/E) \cdot \log(C_1/C_2)$  in which  $C_1$  and  $C_2$  are concns. of  $\text{Au}^+$  in solns. containing the same  $[\text{SCN}^-]$ . The mean of the value found was  $m = 1.02$ ;  $n:m = 1.99$ , clearly indicating  $\text{Au}(\text{SCN})_2$  in soln. In the solns. used  $[\text{SCN}^-]$  varied from 0.1 to 1 molar;  $[\text{Au}]$  1-40 decimillimolar; acid, 0.0003-1 molar. It is concluded that the detn. by Abegg and Campbell (*Z. Elektrochem.* 13, 440(1907)) of the normal potential of gold-auroion is merely the oxidation potential of  $\text{HNO}_3$  since platinized Pt electrodes gave approx. the same values as their gold electrodes. The normal potential of  $\text{Au}-\text{Au}(\text{SCN})_2$  was detd. at  $20^\circ$  against a 0.1 N calomel electrode from  $E' = {}_0E + \frac{RT}{F} \ln \frac{[\text{Au}(\text{SCN}^-)_2]}{[\text{SCN}^-]}$ , (Henderson, *Z. phys. Chem.* 59, 118; 63, 325(1907-8)), where  $E'$  is the measured e. m. f. + 0.016 diffusion potential. For  ${}_0E$  was found +0.352 which, plus 0.337, gives for the potential toward N hydrogen,  ${}_0E_h = +0.689$  v. From this and Bodländer's (*Ber.* 36, 3933(1903)) value for the potential  $\text{Au}-\text{Au}(\text{CN})_2 = -0.611$  v., was calcd. the relative complexity (stability) of the complex ions from  ${}_0E' - {}_0E = (RT/F) \ln(K'/K)$ , where  ${}_0E$  and  ${}_0E'$  are the two normal potentials and  $K = [\text{Au}(\text{SCN}^-)_2]/[\text{Au}^+] \cdot [\text{SCN}^-]^2$  and  $K' = [\text{Au}(\text{CN}^-)_2]/[\text{Au}^+] \cdot [\text{CN}^-]^2$ .  $K'/K = 10^{\frac{0.689 - 0.611}{0.058}} = 10^{22.4}$ . Neglecting possible formation of  $\text{AuC}(\text{N})(\text{SCN}^-)$ ,  $K'/K = \frac{[\text{Au}(\text{CN}^-)_2] \cdot [\text{SCN}^-]_2}{[\text{Au}(\text{SCN}^-)_2] \cdot [\text{CN}^-]_2} = 10^{22.4}$ . For acid solns. in which the H ion exponent ( $p_H$ ) is less than 9.3. ( $K_{\text{ion}}$  of  $\text{HCN} = 10^{9.3}$ )  $[\text{HCN}]/[\text{CN}^-] = [\text{H}^+]/K_{\text{ion}} = 10^{9.3 - p_H}$ . Eliminating  $[\text{CN}^-]$ ,  $\frac{[\text{Au}(\text{CN}^-)_2] \cdot [\text{SCN}^-]^2}{[\text{Au}(\text{SCN}^-)_2] \cdot [\text{HCN}]^2} = 10^{3.8 + 2p_H}$ . In  $[\text{H}^+] = 1$ , ( $p_H = 0$ ) 2HCN per  $\text{Au}(\text{SCN}^-)_2$  will displace 95% of the  $\text{SCN}^-$ .  $[x/(1-x)]^2 = 10^{3.8}$ ; ( $x = 0.95$ ). In spite of its small stability relative to aurocyanide ion, in presence of excess  $\text{SCN}^-$  aurothiocyanate complex is so little hydrolyzed that the free acid in its soln. can be accurately titrated with NaOH and phenolphthalein. In absence of excess  $\text{SCN}^-$  it is quickly decompd. partially by pure water. Gold electrodes dissolve in aurithiocyanate solns. according to  $2\text{Au} + \text{Au}(\text{SCN}^-)_4 + 2\text{SCN}^- = 3\text{Au}(\text{SCN}^-)_2$ . Pt foil in mixts. of auro- and aurithiocyanate gave a well-defined potential which was found due to the reversible transition between auro- and aurithiocyanate while the Pt was not attacked. Through measurement of this potential could be calcd.: (1) from its change with compn. of the soln., the formula of the aurithiocyanate ion from  ${}_0E = {}_0E' - (RT/2F) \ln ([\text{Au}^{\text{III}}]/[\text{Au}_2][\text{SCN}^-])^2$  based on the assumption of the reaction as aurocomplex +  $2\text{SCN}^- = \text{auricomplex} + 2e$ ; the values of  ${}_0E$  agreed well, showing the assumed reaction correct and the aurocomplex in soln. to be  $\text{Au}(\text{SCN}^-)_2$ ; (2) the normal potential of auro-aurithiocyanate; at  $18^\circ$  the value of  ${}_0E$  found was 0.308v. and for  ${}_0E_h$  0.645 v.; for  $\text{I}_2$  (solid) +  $2e = 2\text{I}^-$ ,  ${}_0E_h = 0.54$  v. and for  $\text{Br}_2$  (liquid) +  $2e = 2\text{Br}^-$ ,  ${}_0E_h = 1.09$  v.;  $\text{Au}(\text{SCN}^-)_4$  is therefore a somewhat stronger oxidizing agent than  $\text{I}_2$  but much weaker than  $\text{Br}_2$ ; (3) the potential of  $\text{Au}(\text{SCN}^-)_4 - \text{Au}$ ; since  $3E(\text{Au}(\text{SCN}^-)_4 - \text{Au}) = 2E(\text{Au}(\text{SCN}^-)_2 - \text{Au})(\text{SCN}^-)_2 + E(\text{Au}(\text{SCN}^-)_2 - \text{Au})$ , (Luther, *Z. physik. Chem.* 34, 488; 36, 385(1901)) for a soln. in which each ion species is 1 molar the  $E$  values are the normal potentials and  $3{}_0E = 2 \cdot 0.645 + 0.689$ ; whence  ${}_0E_h = 0.660$  v.; (4) the stability of the aurithiocyanate ion; combining the normal potentials of  $(\text{Au}(\text{SCN}^-)_4 - \text{Au})$  and  $(\text{AuCl}_4 - \text{Au}) = 1.001$  v. (see below),  ${}_0E - {}_0E' =$

$(RT/3F) (\ln (K'/K)) (K'/K) = 10 [(1.001 - 0.660)/0.0193] = 10^{17.67}$ ; the aurithiocyanate complex has a stability  $K$  about  $10^{17.7}$  times that of aurichloride ion; (5) the value of  $[\text{Au}(\text{SCN}^-)_2]/[\text{Au}(\text{SCN}^-)_4]$  in a gold thiocyanate soln. of unknown compn. can be detd. In the solns. used  $[\text{SCN}^-] = 0.1-0.4$  molar;  $[\text{H}^+] = \text{approx. } 1$ . By spectrophotometric and soly. detns. the presence of  $\text{Au}(\text{SCN}^-)_2$  and  $\text{Au}(\text{SCN}^-)_4$  in solns. of higher  $[\text{SCN}^-]$  was proved and they predominate in solns. of  $[\text{SCN}^-] = 2-4$  molar. They are deeper colored than  $\text{Au}(\text{SCN}^-)_4$ ; at  $\lambda = 578\mu$ , the molar extinction coeff. ( $m\epsilon k = \log (I_0 : I)/l \cdot C$ , where  $l$  is the layer thickness in cm.,  $C$  the molar concn. of Au,  $I_0$  the intensity of the incident, and  $I$  intensity of the emergent light) of  $\text{Au}(\text{SCN}^-)_4$  is 108; of  $\text{Au}(\text{SCN}^-)_2$  about 218; of  $\text{Au}(\text{SCN}^-)_4$  about 248. The stability const. were detd.;

$$K_{\text{Au}(\text{SCN})_2} = \frac{[\text{Au}(\text{SCN}^-)_2]}{[\text{Au}(\text{SCN}^-)_4] \cdot [\text{SCN}^-]} = 1.0; K_{\text{Au}(\text{SCN})_4} = \frac{[\text{Au}(\text{SCN}^-)_4]}{[\text{Au}(\text{SCN})_2] \cdot [\text{SCN}^-]} = 1.1.$$

At small concns. of  $\text{H}^+$  and  $\text{SCN}^-$ ,  $\text{Au}(\text{SCN}^-)_4$  appears to be hydrolyzed with formation of  $\text{Au}(\text{SCN}^-)_2\text{OH}$  and  $\text{Au}(\text{SCN}^-)_2(\text{OH})_2$ ; at  $[\text{H}^+], [\text{SCN}^-] = 0.01$  this hydrolysis is probably not more than 20%. All gold thiocyanate solns. sep. out Au after intervals depending on external conditions. This autoreduction was found to result from 2 reactions:  $3\text{Au}(\text{SCN}^-)_4 + 4\text{H}_2\text{O} \longrightarrow 3\text{Au}(\text{SCN}^-)_2 + 5\text{HSCN} + \text{HCN} + \text{H}_2\text{SO}_4$ , irreversible, and  $3\text{Au}(\text{SCN}^-)_2 \rightleftharpoons 2\text{Au}_2\text{Au}(\text{SCN}^-)_4 + (\text{SCN})_2$ , reversible. The conclusion that free thiocyanogen,  $(\text{SCN})_2$ , exists, was reached as follows: Analytical detns. showed uniformly that for 3 atoms Au reduced 1 mol. of  $\text{H}_2\text{SO}_4$  and 8 equivs. acid were formed. The course of the reaction could be followed through decrease of color or by titration with  $\text{Na}_2\text{SO}_3$  of the unreduced Au. The reaction velocity decreased more rapidly than for even a trimol. reaction and this was found due to the repressive effect of  $\text{Au}(\text{SCN}^-)_2$ . The reaction was clearly irreversible since  $\text{H}_2\text{SO}_4$  and  $\text{HCN}$  could not oxidize  $\text{Au}(\text{SCN}^-)_2$  to  $\text{Au}(\text{SCN}^-)_4$ . Potential measurements with Pt electrodes indicated that in fresh  $\text{Au}(\text{SCN})_4$  solns. 10-20% of the Au was present as  $\text{Au}(\text{SCN}^-)_2$ , while sulfite titration showed all the Au in the auric condition. Spectrophotometric detns. agreed nearly quant. with electrometric; the degree of dissociation was found to be independent of  $[\text{H}^+]$  and  $[\text{SCN}^-]$  and to follow the Ostwald diln. law, showing that only two products were formed; since one was certainly  $\text{Au}(\text{SCN}^-)_2$ , the other must be  $(\text{SCN})_2$ .

$$\text{The mean value of the dissociation const., } K = \frac{[\text{Au}(\text{SCN}^-)_2] \cdot [(\text{SCN})_2]}{[\text{Au}(\text{SCN}^-)_4]} = 0.49 \cdot 10^{-4},$$

was found. It increased about 8% per degree. Measurements of the velocity of the autoreduction at 18° could be expressed with good approximation by  $-\frac{d[\text{Au}^{\text{III}}]}{dt} =$

$$5 \cdot \frac{[(\text{SCN})_2]^2}{[\text{H}^+]^2 \cdot [\text{SCN}^-]^2}.$$

The normal potential of  $(\text{SCN})_2 - \text{SCN}^-$  was calcd. from that of  $\text{Au}(\text{SCN}^-)_2 - \text{Au}(\text{SCN}^-)_4$ ,  $E$ , and the dissociation  $K$  of  $\text{Au}(\text{SCN})_4$  through which  $[(\text{SCN})_2]$  in an  $\text{Au}(\text{SCN}^-)_2 - \text{Au}(\text{SCN}^-)_4$  soln. is detd., by  $E' = E - (RT/2F) \ln K$ , from which  $E' = 0.769$ ; for I the corresponding normal potential is 0.54 and that for Br is 1.09. Thiocyanogen is thus an unstable halogen intermediate between Br and I; in agreement with this  $\text{Br}_2$  was found to be instantly reduced by a  $\text{HCl}$  soln. of  $\text{NaSCN}$ ; the resulting colorless soln. sets free I from  $\text{KI}$ . The capacity to displace I vanishes rapidly. Measurements of the rate of disappearance of this capacity could be expressed by the above velocity equation and the  $K$  found was approx. 5, completely confirming the results from the autoreduction measurements and raising to certainty the hypothesis that the autoreduction is due to formation of free  $(\text{SCN})_2$ . With the halogenic character of thiocyanogen established, the proportionality of the autoreduction velocity to the inverse squares of  $[\text{H}^+]$  and  $[\text{SCN}^-]$  is readily explained by the assumption that  $(\text{SCN})_2$  is hydrolyzed like  $\text{Cl}_2$  to  $\text{HCNSO}$  and  $\text{HCNS}$ ; if 2 mols.  $\text{HCNSO}$  unite,  $-\frac{d[\text{Au}^{\text{III}}]}{dt} =$

$k$ .  $[\text{HCNSO}]^2$ ; by combining with  $([\text{HCNSO}][\text{CNS}^-][\text{H}^+]/[(\text{SCN})_2] = K$  and eliminating  $[\text{HCNSO}]$ ,  $-d[\text{Au}^{\text{III}}]/dt = kK_2\{[(\text{SCN})_2]^2/([\text{H}^+]^2[\text{CNS}^-]^2)\}$ . The analytically detd. reaction for the auto reduction,  $3\text{Au}(\text{SCN})_2 + 4\text{H}_2\text{O} = 3\text{Au}(\text{SCN})_2 + 5\text{HCNS} + \text{HCN} + \text{H}_2\text{SO}_4$ , could be due to the partial reactions:  $\text{Au}(\text{SCN})_2 \rightleftharpoons \text{Au}(\text{SCN})_2 + (\text{SCN})_2$ , instantaneous; (2)  $(\text{SCN})_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCNSO} + \text{H}^+ + \text{SCN}^-$ , instantaneous; (3)  $2\text{HCNSO} \rightarrow \text{H}^- \text{CNSO}_2 + \text{H}^+ + \text{CNS}^-$ , rapid; (4)  $\text{HCNSO} + \text{HCNSO}_2 \rightarrow \text{HCNSO}_2 + \text{H}^+ + \text{CNS}$ , instantaneous;  $\text{HCNSO}_2 + \text{H}_2\text{O} \rightarrow \text{HCN} + \text{H}_2\text{SO}_4$ , instantaneous; (3) alone, because of its relative slowness, detd. the velocity of the autoreduction. The velocity  $K$  increased about 11% per degree. Aurothiocyanate solns. deposit Au according to  $3\text{Au}(\text{SCN})_2 = 2\text{Au} + \text{Au}(\text{SCN})_2 + 2\text{SCN}^-$ ; the reaction is reversible since aurothiocyanate solns. dissolve Au with formation of  $\text{Au}(\text{SCN})_2$ . For the  $K_{\text{equil}} = \frac{[\text{Au}(\text{SCN})_2][\text{SCN}^-]^2}{[\text{Au}(\text{SCN})_2]^3}$ , the value 33 (approx.) was found. It increases

rapidly with decreasing  $[\text{SCN}^-]$  and slowly with decreasing  $[\text{H}^+]$ . Addn. of gold dust hastens it catalytically. In 0.1 mol.  $\text{HCl}$ , 0.5 mol.  $\text{NaSCN}$ , 0.1 mol.  $\text{Au}^{\text{I}}$  at  $40^\circ$ , about 0.5 of the gold seps. in 3 days. Three series of detns. of the p. d. between gold electrodes and  $\text{AuCl}_4^-$  in  $[\text{HCl}]$  sufficient to suppress dissocn. of the complex gave for  $\phi E$  0.671, 0.655, 0.665; av., 0.664, whence  $\phi E_{\text{H}} = 1.001$  v. The considerable uncertainty of the p. d. is probably due to presence of  $\text{Au}^{\text{I}}$ . From the p. d. in 0.1 mol.  $\text{HAuCl}_4$  without addn. of  $\text{HCl}$ ,  $\phi E = 0.817$  v., was calcd. the hydrolysis according to  $\text{AuCl}_4^- + \text{H}_2\text{O} = \text{AuCl}_2\text{OH}^- + \text{H}^+ + \text{Cl}^-$  from  $E' = \phi E + (RT/3F) \ln [0.1(1-x)/(0.1x)^4]$ , whence  $x = 0.069$  or 6.9% hydrolysis in 0.1 mol. soln. For the hydrolysis const.,  $K_h = 0.55 \cdot 10^{-4}$  was calcd. From this value  $\text{HAuCl}_4$  should be hydrolyzed 0.74% in 1 mol. and 45.0% in 0.01 mol. soln. The analytical, electrometric and spectrophotometric data are presented in 55 tables.

A. R. MIDDLETON.

**The ternary system  $\text{CaO-MgO-SiO}_2$ .** J. B. FERGUSON AND H. E. MERWIN. Geophys. Lab., Washington. *Proc. Nat. Acad. Sci.* 5, 16-8(1919); cf. *C. A.* 12, 1718.—This paper presents a summary of the results obtained in a study of the remainder of the fourth ternary system of  $\text{CaO-Al}_2\text{O}_3\text{-MgO-SiO}_2$ . Phases not previously noted are  $\text{CaO} \cdot \text{SiO}_2 \cdot 2\text{CaO} \cdot \text{MgO} \cdot 2\text{SiO}_2$  solid solns. and the *compd.*,  $2\text{CaO} \cdot \text{MgO} \cdot 2\text{SiO}_2$ , which has optical properties practically identical with the mineral *akermanite*. The summarized temp.-concn. relations are shown on a triangular diagram which includes (1) the location of the fields with their boundary curves, (2) the location of the invariant points, (3) the temps. corresponding to the fixed pts., (4) the isotherms which indicate the slopes of the various fields upon a solid model.

A. R. MIDDLETON.

**Amorphous precipitated silica.** P. BRAESCO. *Compt. rend.* 168, 343-5(1919).—Measurements of thermal expansion were made on pptd.  $\text{SiO}_2$  calcined to different temps., using the registering differential dilatometer previously described (*C. A.* 11, 2743). The material was first dehydrated at a dull red heat and successive portions were heated to different temps. up to  $1600^\circ$ . From these, small briquets,  $6 \times 8 \times 50$  mms., were molded under pressure using 5% by wt. of sodium silicate as a binder. The test pieces were then reheated to  $600^\circ$  to insure sintering. It was found that pptd.  $\text{SiO}_2$ , dehydrated and heated only to  $600^\circ$ , behaves exactly like silica glass, which has a small coeff. of expansion. This then is certainly amorphous  $\text{SiO}_2$ . But when calcined to  $1000^\circ$  or above, it shows an abrupt change in expansion between  $220$ - $240^\circ$ , a property entirely characteristic of cristobalite, which, according to LeChatelier, shows at  $225^\circ$  an allotropic change, accompanied by a sharp expansion of 0.98%. The observed total expansion for pptd.  $\text{SiO}_2$  calcined to  $1100^\circ$  and  $1400^\circ$  is 0.80%; and to  $1600^\circ$ , 0.90%. Pptd.  $\text{SiO}_2$ , therefore, which has been calcined to a temp. above  $1000^\circ$  is no longer amorphous, but corresponds to cristobalite.

A. L. FIELD.

**Preparation of organic chlorostannites and -stannates. I. Salts of aliphatic amines.** J. G. F. DRUCE. *Chem. News* 118, 1-3(1919); cf. C. A. 13, 289.—The preps. of Cook (*Am. Chem. J.* 22, 435(1899)) were successfully reproduced. In addition the diethylamine salts were prepd. The *chlorostannite*,  $(Et_2NH)_2H_2SnCl_4$ , was prepd. by warming 3.65 g.  $Et_2NH$  and 5.65 g.  $SnCl_4$  in 70 cc. dil. HCl and concg. to 0.5 vol. Deliquescent crystals, m.  $58^\circ$ . The *chlorostannate* was prepd. by treating 4 g. of the *chlorostannate* in 50 cc. dil. HCl with  $Cl_2$  for 1.5 hrs. and evapg. to small vol., slightly deliquescent crystals, m. with decompn. at  $260^\circ$ ; formula  $(Et_2NH)_2H_2SnCl_4$ . An identical product in larger crystals was obtained by dissolving 4.7 g. of the base and 11.7 g.  $SnCl_4$  in 100 cc. dil. HCl. Methylamine chlorostannite was also prepd. by reduction of MeCN with Sn and HCl and the chlorostannite by reduction with  $SnCl_2$ ; in neither case was the reaction quant. The products were identical with those prepd. by Cook's methods. The reduction of nitriles by Sn or  $SnCl_2$  and HCl appears to be a general reaction. Examples of the reaction are:  $MeCN + 2Sn + 5HCl = EtNH_2.HSnCl_4 + SnCl_2$  and  $2MeCN + 4SnCl_2 + 10HCl = (EtNH_2)_2.H_2SnCl_4 + 3SnCl_4$ .

A. R. MIDDLETON.

**Preparation of organic chlorostannites and -stannates. J. G. F. DRUCE.** *Chem. News* 118, 87-9(1919); cf. preceding abstract.—The following salts are described *aniline chlorostannites*,  $PhNH_2.HSnCl_4.H_2O$ , m.  $105^\circ$  (decompn.);  $(PhNH_2)_2.H_2SnCl_4$ , m.  $160^\circ$ , decomp.  $219^\circ$ , dil. HCl solns. oxidize on standing to the chlorostannate *o-toluidine chlorostannite*,  $(C_7H_7NH_2)_2.H_2SnCl_4$ , m.  $164^\circ$ ; *o-toluidine chlorostannate*  $(C_7H_7NH_2)_2.H_2SnCl_4.H_2O$ , m.  $210^\circ$  (decompn.), and  $(C_7H_7NH_2)_2.H_2SnCl_7.2H_2O$ , m.  $92^\circ$ ; *p-toluidine chlorostannite*,  $(C_7H_7NH_2)_2.H_2SnCl_4$ , m.  $239^\circ$ ; *p-toluidine chlorostannate*,  $(C_7H_7NH_2)_2.H_2SnCl_4.H_2O$ , m.  $298^\circ$  (decompn.); *methylaniline chlorostannite*,  $(PhNHMe).HSnCl_4$ , m.  $106^\circ$ ; *methylaniline chlorostannate*,  $(PhNHMe)_2.H_2SnCl_4$ , m.  $251^\circ$  (decompn.); *dimethylaniline chlorostannite*,  $(PhNMe_2).H_2SnCl_4$ , m.  $87^\circ$ , and *chlorostannate*,  $(PhNMe_2)_2.H_2SnCl_4$ , m.  $166^\circ$ , decomp.  $124^\circ$ ; attempts to prep. *o*-phenylenediamine salts by reduction of *o*-nitroaniline with Sn and HCl or by  $SnCl_4.2H_2O$  lead to no definite compd.; *m-phenylenediamine chlorostannite*,  $C_6H_4(NH_2)_2.HSnCl_4$ , m.  $128^\circ$ , and *chlorostannate*,  $C_6H_4(NH_2)_2.H_2SnCl_4$ , decomp.  $264^\circ$ ; *p-phenylenediamine chlorostannite*,  $C_6H_4(NH_2)_2.H_2SnCl_4$ , m.  $270^\circ$  (decompn.), and *chlorostannate*,  $C_6H_4(NH_2)_2.H_2SnCl_4$ , m.  $230^\circ$  (decompn.); *pyridine chlorostannite*,  $PySnCl_3.HCl$ , m.  $115^\circ$ , and *chlorostannate*,  $Py_2H_2SnCl_4$ , m.  $305^\circ$ ; *quinoline chlorostannite*,  $C_8H_7N.HSnCl_4$ , m.  $127^\circ$ , and *chlorostannate*,  $(C_8H_7N)_2.H_2SnCl_4$ , m.  $258-9^\circ$ . Methods of prepn. have been given in previous papers. All these salts are decompd. by water, some quickly by cold water, others slowly upon warming.

A. R. MIDDLETON.

Radioactive. bismuth hydride (PANETH) 3. Electrolysis of fused sodium and potassium amides (WÖHLER, STANG-LUND) 4. Preparation of certain organic salts of tellurium (HAGEMAN) 10.

## 7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

**Determining the composition of a mixture of similar salts of two metals.** W. R. FIELDING. *Chem. News* 118, 107-8(1919).—*I. Alloy containing 2 metals:* Weigh out a small portion of the alloy, dissolve it in  $HNO_3$ , evap. to dryness, heat until fumes cease to be evolved, and weigh. By equilogarithm calc. the compn. of the alloy. *II. Alloy containing 3 metals:* Convert 1 g. of it into its mixed oxides, and weigh. From a weighed portion of the alloy sep. one component and convert it to its oxide, weigh, and solve the compn. of the alloy by equilogarithm.

EARLE M. BILLINGS.

**Standard alkali for mixed-acid control.** E. HEARSEY AND C. M. JOYCE. *J. Ind. Eng. Chem.* 11, 341(1919).—The authors recommend the use of a standard NaOH soln. prepd. by the procedure of Cowles (cf. *C. A.* 2, 2355), with direct standardization with acid K phthalate as proposed by Dodge. Cf. *C. A.* 9, 277; Hendrixson, *Ibid* 2853. F. W. SMITHIER.

**Method of determining halogens, sulfur and nitrogen in presence of mercury.** MAURICE FRANÇOIS. *Ann. chim.* 11, 5-15(1919).—See *C. A.* 12, 2073. E. J. C.

**Determination of nitrous acid and nitrites.** J. S. LAIRD AND T. C. SIMPSON. Univ. Michigan. *J. Am. Chem. Soc.* 41, 524-31(1919).—Volumetric methods for  $\text{HNO}_2$  in the literature are reviewed and rejected as not satisfactory. The proposed method consists in oxidizing the nitrite in acid soln. with excess  $\text{KMnO}_4$ , reducing this excess with excess  $\text{FeSO}_4$ ,  $\text{Na}_2\text{C}_2\text{O}_4$  or  $\text{H}_2\text{O}_2$ , and titrating the excess reducing agent with  $\text{KMnO}_4$ . Moderate amts. of chloride and small amts. of bromide do not interfere.  $\text{AgNO}_3$  is not a satisfactory standard material for use in connection with quant. detns. of nitrites. Standard  $\text{NaNO}_2$  should be run against known  $\text{KMnO}_4$  by the method given, or the nitrite may be detd. gravimetrically by the reduction of  $\text{AgBrO}_3$ .

E. B. MILLARD.

**Study of the conditions affecting the precise determination of zinc as sulfide.** HAROLD A. FALES AND GERTRUDE M. WARE. *J. Am. Chem. Soc.* 41, 487-99(1919).—The pptn. of Zn from solns. in formic acid by means of  $\text{H}_2\text{S}$  has been studied with special reference to conditions affecting the accuracy of the detn. The most favorable range of  $\text{H}^+$  concn. for quant. pptn. of ZnS in a form suitable for rapid filtering and washing is 0.01 to 0.002. The concn. may be kept within this range during pptn. by means of "buffers," i. e., mixts. of formic acid,  $\text{NH}_4$  citrate,  $(\text{NH}_4)_2\text{SO}_4$ ,  $\text{HCO}_2\text{NH}_4$  and  $\text{HCO}_2\text{H}$ . Granular ZnS is favored in the pptn. not only by a  $\text{H}^+$  concn. within the limits given, but also by a high concn. of  $\text{NH}_4$  salt of a strong acid, by a vol. of 100 cc. for each 0.1 g. of Zn present and by a temp. of 95 to 100°. Passing of  $\text{H}_2\text{S}$  under pressure is desirable both for rapid satn. and to avoid loss of  $\text{HCOOH}$  by evapn. ZnS may be converted into  $\text{ZnSO}_4$  by the direct treatment with  $\text{H}_2\text{SO}_4$  after igniting the filter paper (cf. Sullivan and Taylor, *C. A.* 3, 2279). Test analysis show that the method is applicable to the sepn. of Zn from Fe, Mn and Ni and to the analysis of Zn alloys and ores. If the conditions given in detail in the paper are followed, the method is accurate to 1 part in 1000. E. B. MILLARD.

**The determination of phosphorus in steel, iron, and phosphatic slags.** A. TRAVERA. *Chimie & industrie* 2, 133-41(1919).—T. reviews and discusses the different procedures that have been proposed for the pptn. of phosphomolybdate, and reports in detail a series of expts. made to det. the conditions for obtaining a ppt. of the compn.  $\text{P}_2\text{O}_5 \cdot 24\text{MoO}_3 \cdot 3(\text{NH}_4)_2\text{O} \cdot 3\text{H}_2\text{O}$ . A decided excess of the  $\text{MoO}_3$  reagent should be used (equiv. to 1 to 1.5 g.  $\text{MoO}_3$ ) and the addition of  $\text{NH}_4\text{NO}_3$  suppressed. With the acid concn. usually employed, increasing the excess of  $\text{MoO}_3$  or of  $\text{NH}_4\text{NO}_3$  increases the danger of entraining free  $\text{MoO}_3$ ; this is greatly augmented in a slightly acid medium. Increasing the free acid concn. diminishes the chances of entrainment. T. recommends the following rapid method for routine work: Dissolve 1 g. of steel in a beaker in 15 cc. of  $\text{HNO}_3$  (d. 1.2); oxidize with  $\text{KMnO}_4$  soln. (20 g. per l.), dissolve  $\text{MnO}_2$  and destroy  $\text{HMnO}_4$  with a few drops of  $\text{NaNO}_2$  soln., and add 10 cc. of  $\text{HNO}_3$  (d. 1.33); cover with a watch glass, boil 3 to 4 min., pour into the boiling soln. 25 to 30 cc. of the cold  $\text{MoO}_3$  soln.; stir with a glass rod, striking the sides of the vessel, for 1½ min., transfer to calibrated (against a standard steel) tube, centrifuge, and read off % P. With high Si alloys, add 1 or 2 cc. of HF with the  $\text{HNO}_3$ , and evap. till sirupy; take up with  $\text{HNO}_3$  and proceed as outlined; W. is removed in the usual manner as  $\text{WO}_3$ ; V

and P are sepd. by pouring the soln. into a large excess of boiling NaOH soln.; after filtering, neutralize the soln., add a soln. of an Al salt, and then  $\text{NH}_4\text{OH}$ ; filter, dissolve the  $\text{AlPO}_4$  in  $\text{HNO}_3$  and ppt. the P with  $\text{MoO}_3$  as above. On redissolving a ppt. obtained in a strongly acid medium and reprecip. in a feebly acid medium, the ppt. will contain some free  $\text{MoO}_3$ . The following *slow* method is used in the Creusot works: Treat 1 g. of steel with 15 cc.  $\text{HNO}_3$  (d. 1.20); after action ceases, add 3 cc. HCl, and evap. to dryness, take up with 5 cc.  $\text{HNO}_3$  (d. 1.33) and 5 cc. HCl, cover, and heat to boiling. Add 10 cc. of  $\text{H}_2\text{O}$ , and when all sol. matter is in soln. filter off the  $\text{SiO}_2$ , wash with 2%  $\text{HNO}_3$ , add to the filtrate 25 cc. of  $\text{MoO}_3$  reagent, heat at  $65^\circ$  for 3 hrs., filter on tared filters, wash with 2%  $\text{HNO}_3$ , dry 1 hr. at  $130^\circ$  to  $140^\circ$ , cool, and weigh. *Reagent:* Dissolve at room temp. 100 g. of pure  $\text{MoO}_3$  in 400 cc. of  $\text{NH}_4\text{OH}$  (d. 0.96) and pour the soln. in a const. stream, with stirring into 1250 cc. of  $\text{HNO}_3$  (d. 1.2); heat on a  $\text{H}_2\text{O}$  bath at 60 to  $65^\circ$  for 2 days, and filter. To obtain correct results by the "slow" method, the following conditions should be observed: (a) steel: 20 cc. of  $\text{MoO}_3$  soln. to 30 cc. of soln. (filtrate from  $\text{SiO}_2$ ); (b) Thomas Fe: 25 cc. of reagent under same conditions as (a), working on 0.2 g.; (c) Thomas slag: 25 cc. of reagent in same vol. of soln. as in (a), working on 0.1 g. After evap. to dryness to render  $\text{SiO}_2$  insol., take up with 5 to 7 cc. of  $\text{HNO}_3$  (d. 1.33) and 5 cc. HCl and cover the beaker with a watch glass. The evapn. for  $\text{SiO}_2$  should be carried out on a  $\text{H}_2\text{O}$  bath to facilitate the later re-soln. of the Fe. Filter on a very small paper and wash with a fine jet so that the soln. will not be dild. beyond 35 cc. In the av. control analysis the  $\text{SiO}_2$  and  $\text{Fe}_2\text{O}_3$  retained by the ppt. are of slight importance, e. g., the phosphomolybdate ppt. from 1 g. of steel contained less than 0.5 mg. of  $\text{Fe}_2\text{O}_3$  and less than 0.5 mg. of sol.  $\text{SiO}_2$ . Only in high concns. of chlorides or HCl (in taking up sample after evap. to dryness) is the subsequent pptn. incomplete;  $\text{H}_2\text{SO}_4$  or sulfates in large amts. interfere (the  $\text{HNO}_3$  used should not contain over 5% of  $\text{H}_2\text{SO}_4$  and should be As-free). Flourides or free HF in very small amts. render the pptn. incomplete, and may even prevent pptn. *Control detns. as  $\text{Mg}_2\text{P}_2\text{O}_7$ .* *Steel:* Treat 1 g. portion (about 50) as indicated above, and filter the phosphomolybdates on the same filter; dissolve in  $\text{NH}_4\text{OH}$  (1:3), filter (if necessary), add 1 to 2 g. of  $\text{NH}_4\text{Cl}$  and ppt. with Magnesia mixt. in usual manner. Let stand 24 hrs., filter, wash with dil.  $\text{NH}_4\text{OH}$ ; redissolve in HCl, evap. to dryness on the  $\text{H}_2\text{O}$  bath; take up with a few drops of HCl and 30 cc. of hot  $\text{H}_2\text{O}$ , filter off  $\text{SiO}_2$ , and wash; reprecip. in the presence of citric acid, let stand 12 hrs., filter, wash with cold, strongly ammoniacal  $\text{H}_2\text{O}$ , ignite, and weigh as  $\text{Mg}_2\text{P}_2\text{O}_7$ . *Thomas Fe:* Treat 2 g. with aqua regia ( $1\frac{1}{2}$   $\text{HNO}_3$ ), adding sufficient  $\text{AlCl}_3$  to yield 0.3 g. of  $\text{Al}_2\text{O}_3$ ; neutralize with  $\text{NH}_4\text{OH}$  until the ppt. formed just redissolves, cool, add a soln. of 8 to 10 g. of  $\text{Na}_2\text{S}_2\text{O}_8$ , and boil about 15 min., adding very dil.  $\text{NH}_4\text{OH}$  dropwise from time to time to assure almost complete neutrality (use litmus paper). Let settle, decant rapidly, wash by decantation with boiling  $\text{H}_2\text{O}$ ; finally ignite the ppt. in a porcelain crucible. Treat in Pt with HF and  $\text{H}_2\text{SO}_4$  to remove  $\text{SiO}_2$ ; fuse with about 10 g. of  $\text{Na}_2\text{CO}_3$ , take up with 50 cc. of boiling  $\text{H}_2\text{O}$ , filter and wash; acidify with  $\text{HNO}_3$ , add 40 cc. of  $\text{NH}_4$  citrate soln. (150 g. of citric acid per l.), a slight excess of Magnesia mixt., 2 to 3 g. of  $\text{NH}_4\text{Cl}$ , and an excess of  $\text{NH}_4\text{OH}$ ; stir, let stand 12 hrs., filter, wash with cold, strongly ammoniacal  $\text{H}_2\text{O}$ , and finally ignite and weigh as  $\text{Mg}_2\text{P}_2\text{O}_7$ . It is preferable to make a double pptn. to eliminate Na salts. *Slags:* The direct pptn. of the  $\text{P}_2\text{O}_5$  by Mg mixt. may be made by the usual citric acid procedure without removing Fe. The slag should be finely powdered, and the  $\text{SiO}_2$  eliminated by 2 evapns. on the  $\text{H}_2\text{O}$  bath. The  $\text{SiO}_2$  retains about 0.1% of  $\text{P}_2\text{O}_5$ , which can be recovered or taken into account. T. also outlines the methods of detg.  $\text{P}_2\text{O}_5$  by titrating  $(\text{NH}_4)_2\text{ZnPO}_4$  or  $(\text{NH}_4)_2\text{MgPO}_4$  (pptg. hot) with acid and Me orange.

F. W. SMITHER.

The determination of uranium in alloy steels and ferro-uranium. G. L. KELLEY,

F. B. MYERS AND C. B. ILLINGWORTH. *J. Ind. Eng. Chem.* 11, 316-7(1919).—The method is described in detail. It provides for the presence of Cr, Mo, V, W, Co, Ni, C, Mn, Si, P, and S. F. W. SMITHER.

The testing of sodium bisulfite in the laboratory of the A. V. R. O. S. F. C. VAN HEURN. *Arch. Rubbercult. Nederland. Indië* 2, 12-21; *Meded. Alg. Proefstat. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser.* No. 6, 12-21(1918); *Expt. Sta. Rec.* 39, 413.—V. states that technical samples of  $\text{NaHSO}_3$  generally contain in addition to the bisulfite itself, some  $\text{Na}_2\text{SO}_3$  and  $\text{Na}_2\text{SO}_4$ . The second component is most valuable, while the third is quite worthless. In dissolving the sample for analysis the  $\text{NaHSO}_3$  becomes  $\text{Na}_2\text{SO}_3 + \text{H}_2\text{SO}_3$ . Taking this into consideration, the following method of analysis has been developed: About 1 g. of the material is weighed in a weighing tube, a small quantity of water added, and the soln. poured into a graduated glass-stoppered volumetric flask and made up to 1 l. This soln. is used for all detns. To det. the amt. of  $\text{SO}_2$  present as real bisulfite, 100 cc. of the soln. is placed in an Erlenmeyer flask and titrated with 0.1 N KOH, using phenolphthalein as an indicator. Double the quantity of  $\text{SO}_2$  found is present as bisulfite. This amt. multiplied by 1.63 ( $\text{NaHSO}_3/\text{SO}_2 = 1.63$ ) gives the max. amt. of  $\text{NaHSO}_3$  that can be present. To det. the total amt. of  $\text{SO}_2$ , some of the original soln. is placed in a buret and titrated with 25 cc. of 0.1 N I. The amt. of  $\text{SO}_2$  present as normal sulfite is then found by subtracting from the total  $\text{SO}_2$  the amt. present as bisulfite. To det. the amt. of sulfate 100 cc. of the soln. is placed in an Erlenmeyer flask, and 1 cc. of concd. HCl and a few drops of alc. are added. The air in the flask is replaced by  $\text{CO}_2$ , and the soln. is heated and pptd. with a 10% soln. of  $\text{BaCl}_2$ . E. J. C.

Sodium pyrogallate solution as an absorbent for oxygen. G. W. JONES AND M. H. MEIGHAN. *J. Ind. Eng. Chem.* 11, 311-6(1919).—"A new app. for testing the relative absorption of O with different solns. has been devised. Tests made over a wide range of concns. of the different reagents show that the rate of O absorption in Na pyrogallate solns. increases with the diln. of the NaOH and for any given concn. of NaOH the rate of absorption is proportional to the concn. of the pyrogallic acid. Na pyrogallate solns. made by using NaOH solns. of less than d. 1.30 give off CO which increases with the diln. All Na pyrogallate solns. give off CO when analyzing O samples containing above 95% O. A Na pyrogallate soln. which gives off a minimum amt. of CO, having a fairly high rate of absorption, and adapted for pipets, using glass tubes, is recommended, with directions for its prepn." F. W. SMITHER.

The determination of zinc and copper in gelatin. G. S. JAMIESON. *J. Ind. Eng. Chem.* 11, 323-5(1919).—J. describes in detail, with exptl. results, a method based on hydrolyzing the gelatin in HCl soln. and subsequently detg. the Cu and Zn by well known procedures. F. W. SMITHER.

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New biological reaction for iron (BEIJERINCK) 11C.

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## 8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

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EDGAR T. WHERRY AND J. H. BOWER.

Meteoric iron from Chili (Dehesa). F. BERWERTH. *Min. Petr. Mitth.* 34, 272; *J. Chem. Soc.* 114, II, 403(1918).—This mass was described by Daubrée in 1868, and was stated by Domeyko to have been found in the Cordillera de la Dehesa, near Santiago. From its compact appearance and Domeyko's analysis (Ni 14%), it was placed in the group of Ni-rich "compact irons." Microscopical examn. of an etched surface shows, however, that the structure is octahedral. The following new analysis (mean of 2 by



E. Dittler) was therefore made, showing that this iron belongs to the group of very fine octahedrites: Fe 87.40, Ni 11.97, Co 0.56, insol. (schreibersite) 0.07%. J. H. B.

International control of minerals. C. K. LEITH. U. S. Geol. Survey, *Mineral Resources of U. S., 1917*, Part I, 70-160 (Preprint B, published Dec. 31, 1918). E. H.

Banded structures of the Adirondack syenite-granite series. WILLIAM J. MILLER. *Science* 48, 560-3(1918).—Description and discussion of the origin of these structures. J. H. B.

Antimony in the Transvaal (GALBREATH) 9. System  $\text{CaO-MgO-SiO}_2$  (FERGUSON, MERWIN) 6.

## 9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Quicksilver in 1917. F. L. RANSOME. With a bibliography. I. P. EVANS. U. S. Geol. Survey. *Mineral Resources of U. S., 1917*, Pt. I, 367-455; Preprint No. 17 (published Mar. 18, 1919). E. J. C.

Production of pig iron in the United States in 1918. ANON. *Iron Age* 103, 889 (1918).—Tables of statistics. E. J. C.

Report of Allen Property Custodian on the metal industry. *Chem. Met. Eng.* 20, 313-7(1919). E. J. C.

Antimony in the Transvaal. N. M. GALBREATH. *J. S. Afr. Assoc. Anal. Chem.* 1918, 1, 9-10; *J. Soc. Chem. Ind.* 37, 626-7A(1918).—The deposits of the Murchison Range, N. E. Transvaal, contain up to 10% Sb and 4 dwt. Au per ton. Part of the latter is apparently enclosed in the stibnite, as cyaniding does not give good extn. Liquation on sloping triangular hearths has been tried;  $\frac{1}{3}$  of the Sb is extd., while the bulk of the Au remains in the residue. Flotation was fairly successful on an exptl. scale. S. G. GORDON.

Effect of air in cyanidation. N. S. KEITH. *Eng. Mining J.* 107, 522-3(1919).—A discussion. "It has been satisfactorily and practically demonstrated in many large cyanide mills that the removal of air from cyanide solns., before pptn., results in considerable savings of both cyanide and Zn." F. W. SMITHER.

Production of ferro-manganese in the blast furnace. P. H. ROYSER. *Bull. Am. Inst. Mining Eng.* 1919, 367-78.—See C. A. 13, 689. B. H. SMITH.

Experiments in fettling reverberatory furnaces. F. RUTHERFORD AND B. H. SMITH. *Eng. Mining J.* 106, 109-10(1918).—R. describes briefly exptl. work, carried out at the Copper Queen plant at Douglas, Ariz., in 1912, resulting in the adoption of the method of side-feeding hot calcines, as against center feeding of the hot calcines and side fettling with siliceous material. F. W. SMITHER.

New lead-zinc mill in Colorado. ANON. *Eng. Mining J.* 107, 397-8.—Central Colorado Mining Co. ore is handled by a system of Jeffrey conveyors, classified by trommel screens, and ground in ball mills for flotation. B. H. SMITH.

Dry gas cleaner. ANON. *Iron Age* 103, 766-7(1919).—A description of the Kling-Weidlein dry gas cleaner. The advantages claimed for the dry cleaning over wet washing of furnace gases are: (1) Sensible heat of the gas is retained; (2) when burned under boilers, the gas generates more steam; (3) when burned in hot blast stoves, it produces higher blast temp.; (4) no  $\text{H}_2\text{O}$  is required for cleaning the gas; (5) no settling basins are required; (6) less ground space is required; (7) there is no pollution of streams; (8) labor cost in handling the dust is less; (9) less than  $\frac{1}{10}$  the power is

required to operate; (10) there is less back pressure on the furnace; (11) cleaning efficiency is as good as in the best types of wet washers; (12) no sludge drips from gas mains and burners.  
F. W. SMITHER.

**Retreating zinc tailings in Wisconsin.** W. F. BORRICK. *Eng. Mining J.* 107, 524-7(1919).—An account of the attempts made to re-mill some of the old tailings dumps in the Wis.-Ill. field. In no case were operations undertaken on a large scale. Neither the size of the piles nor the Zn content of the tailings warranted large expenditures for equipment.  
F. W. SMITHER.

**Ruck zinc-distilling furnace.** ANON. *Eng. Mining J.* 107, 307-8(1919).—A special feature is the system of gas and air conduits in the front wall of the furnace to improve heating of the front ends of the retorts. Coal consumption is 1.15 tons per ton of ore.  
B. H. SMITH.

**International Nickel Company's refining works at Port Colborne, Ont.** W. L. WOTHERSPOON. *Eng. Mining J.* 107, 429-35(1919).—The works located on the shore of Lake Erie consist of 31 buildings, steel frame and brick walls. Among these are a sewage plant using the activated-sludge process, change houses, hospital and clubhouse. The mat is smelted with salt cake, Ni is sepd. and Cu is bessemerized in Allis-Chalmers converters with elec. tilting gear. Elec. driven, directly connected turbo blowers are used for cupolas. Flue gases are treated by a modern Cottrell pptn. plant. NiS is ground in ball mills, chemically treated and refined in specially designed oil-burning furnaces. All material is handled and weighed mechanically. Two special B. & W. boilers utilize in power plant the waste heat from Ni furnaces. Generators and blowers are run by Ridgway-Rateau h. p. turbines. Turbo-blowers are particularly economical of space. The plant has an annual capacity of 15,000,000 lb. Ni and 8,000,000 lb. Cu.  
B. H. SMITH.

**Applications of optical pyrometry in steel works practice.** J. N. GREENWOOD. *Trans. Faraday Soc.* 13, 295-308(1918).—Summary: "(1) The various conditions of use of an optical pyrometer in taking the temps. of liquid steel in the open have been compared with the calibration conditions, and have been shown to differ widely from them. (2) The errors due to the deviations considered in (1) have been shown to fall into 2 classes according to whether they were or were not accurately determinable. To the first class belong errors due to emissivity and polarization of the emitted light. To the second class belong such as are due to lack of monochromatism of the absorbing screen (absent in such types as the Wanner), to fumes, to light reflected from external sources, and to smallness of the source of light. (3) Several technical defects of the Cambridge optical pyrometer have been considered. (4) A suggestion has been made that in order to obtain control of the steel-making process pyrometrically, a refractory tube should be inserted into the bath when it is required to take the temps. A true black body condition would then be very nearly approached. (5) The use of optical pyrometry in the heat treatment of Fe and steel is next dealt with. It is shown that the scale on billets (formed during reheating) causes difficulties: (a) Inside the furnace at temps. below 800° to 900°, due to light reflected from the flames, (b) outside the furnace owing to its low thermal cond. (6) A comparison made between the Cambridge optical and the Siemens H<sub>2</sub>O pyrometer under normal working conditions has shown that, although the latter is capable of an accuracy of 10°, it is unreliable owing to the large personal factor involved."  
F. W. SMITHER.

**Optical pyrometry in non-ferrous metallurgy.** F. G. DONNAN. *Trans. Faraday Soc.* 13, 276-9(1918).—A discussion based on the work of Stubbs and Prideaux. Cf. C. A. 8, 862.  
F. W. SMITHER.

Steel from nickel-copper-iron ore shows high strength. R. W. LEONARD. *Eng. News-Rec.* 80, 812(1918).—The author reports the results of expts. in the production of a high-strength steel from the Sudbury Fe ores containing Cu and Ni. The product, known as "Nicu" steel, is to be made by the Nicu Steel Corporation. In an improvised plant at East Montreal 200 tons of ore and 40 tons of slag were smelted; after roasting, smelting with CaO flux in an elec. furnace performs the principal reduction, yielding a pig Fe of homogeneous compn.; this was refined to medium-C steel partly in an elec. furnace and partly in an open-hearth furnace using producer gas. The av. charge in the smelting furnace was 1400 lb. of roasted ore, 525 lb. of burned lime, and 375 lb. of coke breeze or coal. The av. analysis of the weathered ore was: Fe, 46; Ni, 1.3; Cu, 0.28; SiO<sub>2</sub>, 19.9; Al<sub>2</sub>O<sub>3</sub>, 3.8; S, 1.5 to 3; CaO, 2.7; MgO, 1.3%. The pig Fe produced averaged: S, 0.09; P, 0.07; Mn, 0.18; Si, 1.75; C, 3.0; Ni, 2.20; Cu, 0.40%. The company believes that equally satisfactory results can be obtained by smelting in an ordinary blast furnace after roasting the ore to about 1.5% S and then nodulizing in rotary kilns. In 10 of the heats, steel was produced having: C, 0.17; to 0.73 Si, 0.012 to 0.032; S, below 0.048; P, generally below 0.01%. The sum of Ni and Cu ranged from 1.25 to 2.5%, Cu usually being about 1/4 of the total. Tests showed: tensile strength, 96,500 lb./sq. in.; yield point, 52,800; elongation (in 2 in.), 24.3%; reduction of area, 50.8%; and a 180° bend test flat without cracking. The combined Ni and Cu in this specimen was 2.26%. "Nicu" steel has not as yet been manufd. on a com. scale.

F. W. SMITHER.

Electric arc welding. R. E. KINKAD. *Engineering* 106, 185, 213-5(1918).—In autogenous welding by the elec. arc and O-C<sub>2</sub>H<sub>2</sub> processes the metals are heated to a liquid state, poured together into a homogeneous molten mass and allowed to cool. With very few exceptions the same operations may be performed by either process, but the very great localization of the heat in arc welding gives it a marked advantage over O-C<sub>2</sub>H<sub>2</sub> for welding on boiler-plate and sheet metal. The higher temp. of the arc and the greater heat localization enable it to do at least 3 times more welding with the same amt. of heat than is possible with O-C<sub>2</sub>H<sub>2</sub>. The approx. heat quantities involved in the welding arc are expressed by the formula  $H = E \times I / 1000 \times T \times 3413$ , where  $H$  = heat in B. t. u.,  $E$  = av. e. m. f. across arc,  $I$  = av. current in arc circuit,  $T$  = time arc is in operation in hrs., and 3413 = heat equiv. of 1 kw.-hr. energy in B. t. u. The heat liberated by the O-C<sub>2</sub>H<sub>2</sub> flame may be calcd., knowing that 1 cu. ft. of an O-C<sub>2</sub>H<sub>2</sub> mixt. gives about 1550 B. t. u. The author discusses the applications of arc welding and gives comparisons of same with old methods and gas welding.

F. W. SMITHER.

Electric arc-welding apparatus. W. L. MERRILL. *J. Eng. Club Phil.* 35, 436-9 (1918); *Sci. Abstracts* 21B, 441(1918).—Successful welding can be done with both a. c. and d. c., and both systems have their advantages, the choice of either depending upon local conditions. The low voltage used for welding (12 to 15 v. on d. c., and 20 to 30 v. on a. c.) raises a problem in detg. the best method of distribution. The author discusses the various systems in use.

F. W. SMITHER.

Electric welding with covered electrodes. E. G. RIGBY. *J. Eng. Club Phil.* 35, 472-82(1918); *Sci. Abstracts* 21B, 406-7.—Welds made by plain Fe or C rods as electrodes are frequently deteriorated by pitting and oxidation, resulting in brittleness and porosity and breaking up of the metallic structure. Oxidation renders a joint peculiarly liable to corrosion. In the covered-electrode process the electrodes are surrounded by a covering of blue asbestos yarn which in fusing acts as a reducing agent, and by excluding the atm. from the fused metal prevents oxidation. The yarn is coated with silicate of Na, Al, or the like, to vary the fusing temp. The electrode, further, has combined with it a small amt. of metal capable of exerting a strong re-

ducing action, such as Al, in the form of a fine wire incorporated in the covering. Various methods of applying the process are described and illustrated in the original.

F. W. SMITHER.

**Electric arc welding in railway shops.** R. WANAMAKER. *Engineering* 106, 185-6 (1918).—The paper demonstrates the importance in war of elec. arc welding for repair work, especially in locomotive shops. A general description of the process is given, and comparisons are drawn between the elec. and other methods of welding.

F. W. SMITHER.

**Advantages of spot welding.** G. A. HUGHES AND R. H. POOL. *Elec. World* 73, 734-5 (1919).—A general outline of spot-welding methods is given with illustrations to show the effectiveness of elec. welds.

C. G. F.

**Practical data upon electric spot welding.** G. A. HUGHES AND R. H. POOL. *Elec. World* 72, 742-4 (1918).—Tests were made on 30-kw. 220-v. 60-cycle hand-operated machines. The data give an idea of power consumption, the strength of the weld and the speed at which welds can be made. Scale and rust cause arcing and burning. Weak and porous welds were avoided by burning off scale and rust by forcing the welding contacts firmly on the material and turning the power on the welder for a moment. Then the power was turned on and the material brought to welding heat without arcing. This saves cleaning the stock and increases the life of the welding points 50%.

W. H. BOYNTON.

**Heat treatment of low-carbon steel.** W. M. WILKIE. *Mech. Engr.* 41, 239-44 (1919).—The characteristic structures found in steel are described. The article deals at length on cast, (i. e., unworked) and hot-worked steel, cooled slowly, cooled rapidly, and reheated. A system of strengthening steels on high-explosive shells is known as the Sandberg air-cooling method, whereby rapid cooling by air increases the ultimate strength with an increase in the elastic ratio, but with very little variation in the ductility of the steel. By this method air at pressures ranging from 6 ozs. to 15 ozs. usually around 10 ozs., is either passed around the shell forging or forced to impinge on the revolving shell in such a way that a shell that would usually cool in 30 minutes in the open air, is cooled in six to eight minutes. By this method the strength is raised from 4,000 to 10,000 lbs. In an appendix the results on Electric and Basic Steels are given. This process was allowed free use to manufacturers of forgings during the war; it is applicable to steel rails to improve their wearing qualities.

E. G. JARVIS.

**Magnetic iron alloys.** ANON. *Ber. Phys.-Techn. Reichsanstalt* 1917; *Stahl u. Eisen* 38, 1043 (1918); *J. Soc. Chem. Ind.* 38, 17A.—In expts. made with a view to substitute Cr-steel for W-steel, it was found that in the case of bar magnets of Cr-steel left undisturbed for 1 year the alteration of the magnetic moment in the best specimens amtd. to only 0.1-0.3% and was within the limits of exptl. error in nearly all the specimens examd. during the latter half of the year. Suitable Cr-steels form an almost completely satisfactory substitute for W-steel magnets, but the "efficiency" as measured by the product of the remanence and coercive force is not quite so high in the case of the best Cr-steels as in that of the best W-steels.

E. J. C.

**Effects of phosphorus on malleable cast iron.** J. H. TENG. *Foundry* 47, 151-6 (1919).—See *C. A.* 12, 2524.

E. J. C.

**Influence of antimony on the mechanical properties of copper.** W. STAHL. *Metall u. Erz* 15, 395-6 (1918); *J. Soc. Chem. Ind.* 38, 43A.—The presence of 0.3-0.4% of Sb in pure Cu increases the hardness and general value of the metal. Admixt. of 0.15% of Ni and 0.15% of Sb also increases the hardness and quality of the metal provided that any flakes of oxide formed are removed by careful "poling" during the refining of the Cu. In Cu alloys contg. more than 2% Ni, Sb is harmful. It is also harmful

in Cu contg. Mn. In smelting Cu contg. 0.05% Bi, sufficient Sb should be added to convert the Bi into an antimonate. In the presence of Pb, Sb acts detrimentally on Cu, unless the Pb is present as antimonate.

E. J. C.

**Determination of the composition of binary alloys by specific-gravity determination.** M. VON SCHWARZ. *Bayr. Ind. u. Gewerbebl.* 104, 61-3(1918); *Z. angew. Chem.* 31, 310; *J. Soc. Chem. Ind.* 37, 738A.—In detg. the sp. gr. of alloys by Matthiessen's formula,  $d = 100/[(A/a) + (B/b)]$  where A and B are the percentages of the 2 metals in the alloy and *a* and *b* their sp. gr., an allowance must be made for the alteration in *d*. due to contraction and in a few cases for that due to expansion. The method of using the sp. gr. as a means of detg. the compn. finds practical application, principally for Sn-Pb and Sb-Pb alloys, of which samples of definite vol. can be cast and their wt. compared with those of similar substances of known compn. on the so-called Sn assay balance. Instead of the usual disk or conical samples, balls are now used which can be obtained uniform and of an exact vol. Using balls of a vol. of 1.62 cc. and weighing to 0.01 g., the compn. of Sn-Pb or Sb-Pb alloys can be obtained from the sp.-gr. curves with an accuracy within the limits of 0.5-1.0%.

E. J. C.

**Property of certain waters with reference to their action on metals (PARR) 14.** **Potash recovery (in blast furnace industry) (GELLERT) 18.** **Use of pulverized coal at the Bunker Hill and Sullivan smelting and refining plant (RICE) 21.** **Iron protection by paint (FRIEND) 26.** **Device for sampling (RILEY) 1.** **Electric heat treatment of gun forgings (WRIGHT) 4.**

**TIEMANN, HUGH P.: Iron and Steel. (A Pocket Encyclopedia) Including Allied Industries and Sciences.** Introduction by Henry Marion Howe. 2nd Ed. Enlarged and revised. New York: McGraw-Hill Book Co. 514 pp. \$4. For review see *Eng. News-Record* 82, 781(1919); cf. *C. A.* 12, 359.

**Concentrating deslimed pulp by flotation.** RUDOLF GAHL. Can. 189,754, Apr. 22, 1919. Deslimed pulp is submitted to flotation to produce a middling product which is roasted and leached to ext. the metal. The tailings from the concn. may be similarly treated.

**Apparatus for flotation separation of sulfide ores.** T. J. PENNINGTON. U. S. 1,294,531, Feb. 18.

**Ore-separation.** A. J. MOXHAM. U. S. 1,294,519, Feb. 18. Constituents of ores of different sp. gr. are sepd. by passing the material through a bath of liquids of different sp. gr., one floating on the other, *e. g.*, a soln. of  $MnBr_2$  or  $ZnBr_2$  or  $H_3PO_4$  on  $AsBr_3$ , so that the particles of the ore are first coated with the lighter liquid and this coating weakens the bond which tends to form between the solid particles and the heavier liquid when they are immersed in the latter. The heavier liquid serves as a medium for sepn. of constituents such as Fe oxide from gang. Sepd. material is removed from the heavier liquid through the lighter liquid so that the latter serves to remove the adhering heavier liquid from the particles.

**Ore concentrator.** M. R. O'SHAUGHNESSY. Can. 187,886, Dec. 10, 1918. Structural features of an ore classifier and selector.

**Apparatus for ore concentration.** F. GROCH. Can. 189,631, Apr. 15, 1919. The air is given a spiral movement throughout the major portion of the length of the agitating chamber and a vertical movement in the upper portion. The app. is specified.

**Apparatus for ore concentration.** F. GROCH. Can. 189,505, Apr. 8, 1919. The impeller has a rotatable hollow body having axial inlet ports in its opposite walls and

a peripheral discharge opening, a partition within the body in spaced relation to the opposite walls thereof and terminating short of the periphery and dividing said hollow body into compartments and impeller blades in at least one of the compartments, the blades extending beyond the partition.

**Reducing oxide ores.** J. W. MORFAT. U. S. 1,294,514, Feb. 18. Ores which may contain Fe or other metals are reduced without fusion in any suitable furnace, and then, after reduction, excluded from contact with oxidizing gases while the temp. of the product is above the lower limit at which reoxidation might take place. The reduced material is then placed in an elec. furnace and fused in an inert or reducing atm. By reducing Fe oxides before they reach the elec. furnace, injury to the lining of the latter is avoided.

**Extracting tungsten from ores.** D. J. GILES and J. E. GILES. U. S. 1,293,402, Feb. 4. W is extd. from ores with a hot soln. of NaOH under pressure, forming sol. Na tungstate, and the latter, in dild. soln., is treated with  $\text{Ca(OH)}_2$  or  $\text{CaCl}_2$  or other sol. Ca salt to ppt. insol. Ca tungstate from the hot soln.

**Extracting tungsten from ores.** D. J. GILES and J. E. GILES. U. S. 1,293,403, Feb. 4. W ore is treated with a hot soln. of NaOH under pressure to form a soln. of Na tungstate and this soln. is sepd. from the gang and treated with  $\text{Ca(OH)}_2$  to ppt. insol. Ca compds. of Si and P. This preliminary pptn. is carried out at a relatively low temp., preferably about  $20^\circ$ , and the residual soln. is then treated with  $\text{Ca(OH)}_2$  at a higher temp., preferably about  $95^\circ$ , to ppt. Ca tungstate.

**Extracting tungsten from ores.** D. J. GILES and J. E. GILES. U. S. 1,293,404, Feb. 4. W is obtained from ore in the same manner as in the process of the preceding pat. except that HCl or other acid is used as the pptg. agent in the final step of the process, instead of  $\text{Ca(OH)}_2$ .

**Platinum recovery from ores by amalgamation.** R. E. LYONS. U. S. 1,293,828, Feb. 11. Pt is recovered from gang by amalgamation with Hg in the presence of metallic Zn and a substance such as an acid or NaOH which is capable of attacking the Zn and which serves by its reaction with the Zn to decompose the Zn amalgam formed.

**Extracting zinc from ore.** H. L. SULMAN and H. F. K. PICARD. U. S. 1,295,080, Feb. 18. Zn-bearing material is leached with 10%  $\text{H}_2\text{SO}_4$  to dissolve the Zn, the soln. is filtered off from the residue, the latter is washed to remove soln. remaining in it, milk of lime is added to the washings to ppt.  $\text{Zn(OH)}_2$  and the ppt. thus formed is added to the soln. produced from a fresh batch of Zn-bearing material by acid treatment, to neutralize the acid. The method is especially adapted for extg. Zn from roasted sulfide ore.

**Winning metals.** V. M. WEAVER. Can. 190,054, Apr. 29, 1919. Al and Si are extd. from clay by treating the clay with Cl in the presence of C to form  $\text{AlCl}_3$ ,  $\text{SiCl}_4$  and CO, the chlorides are sepd. and the metals extd. and the Cl is reused. The process is applied generally to the extn. of a metal from a substance containing it and Si and O with a halogen and a reducing agent inert to the halogen.

**Apparatus for winning metals.** V. M. WEAVER. Can. 190,055, Apr. 29, 1919. The app. comprizes in combination a furnace, a condenser connected therewith, a collecting receptacle connected with the condenser, which has a valve-controlled gas outlet, an electrolytic vat connected with the receptacle and a gas-collecting tank connected with the vat.

**Precipitation of metals from solutions.** T. B. CROWE. Can. 189,693, Apr. 15, 1919. The gases entrained in the soln. are removed by subjecting the soln. to a vacuum.

**Producing iron and steel.** W. T. STEPHENS. Can. 188,823, Feb. 25, 1919. Steel scrap mixed with fuel is heated to a temp. below the fusion pt. in a suitable furnace, then charged and compacted in a second furnace, where it is treated with the necessary fluxing agents.

**Producing pig iron.** F. H. CROCKARD. Can. 189,709, Apr. 15, 1919. Steel scrap with fluxing materials and coke is charged into a blast furnace and smelted to produce iron. Cf. C. A. 12, 1966.

**"Dry galvanizing."** D. R. WARD. U. S. 1,294,001, Feb. 11. Articles of Fe to be coated with Zn are heated in a closed chamber in a dry mixt. of pulverulent Zn particles which are coated and mixed with 25% or less of graphite.

**Hot-blast stoves.** J. I. LARIMER. Can. 189,222, Mar. 18, 1919. A multiple-pass stove has a dome-shaped top and a zigzag shaped wall sepg. adjacent passes and adapted to deflect gases without an abrupt turn.

**Four-pass hot-blast stoves.** JAS. I. LARIMER. Can. 189,223, Mar. 18, 1919. A four-pass hot-blast stove has brick checkerwork in the passes, metal checkerwork near the outlet from the last passages and has the flue opening in the several passes and in the metal checkers successively smaller.

**Producing ferrosilicon of high silicon content in blast furnaces.** JOS. E. JOHNSON, JR. Can. 189,595, Apr. 8, 1919. Ferrosilicon is produced in a blast furnace by charging the furnace with ore and fuel and supplying a blast containing O in greater proportion than in atm. air. Cf. C. A. 12, 1046.

**Alloying furnace.** F. L. MCGAHAN. Can. 189,280, Mar. 25, 1919. A furnace embodying a roasting chamber, a smelting chamber and a melting chamber specially adapted for making alloys is specified.

**Aluminium-zinc-copper alloy.** D. J. HAUSS. U. S. 1,293,426, Feb. 4. An alloy resistant to corrosion is formed of Al 72, Zn 24-25, and Cu 3 parts, substantially free from oxides. A small amt. of Mg may be used as a deoxidizing agent in forming the alloy.

**Soldering-flux.** G. P. LUCKEY. U. S. 1,293,823, Feb. 11. A soldering-flux composed of 65%  $\text{ZnCl}_2$ , 10%  $\text{NH}_4\text{Cl}$ , and 25% of a fused mixt. of KCl 56 and NaCl 44 parts is used in soldering at temps. as high as 400°.

## 10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

**The mutual condensation of unsaturated compounds in connection with terpenes, resins and rubber.** H. J. PRINS. Hilversum. *Chem. Weekblad* 16, 64-74(1919).—A review, with particular reference to polymerization of unsatd. compds. and the vulcanization of rubber. It is maintained that this type of reactions cannot be explained under one grouping without the aid of the valence theory and the theory of mutual activation.

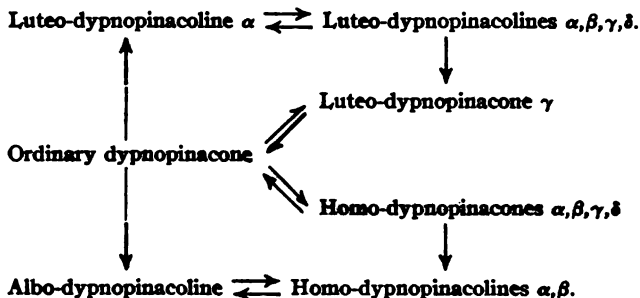
JULIAN F. SMITH.

**Some naphthalene derivatives.** A. A. BOON AND JAMES OGILVIE. *Pharm. J.* 101, 129-30(1918).—In the prepn. of the mono-arsonic acid, 1,4- $\text{C}_{10}\text{H}_6(\text{NH}_2)\text{AsO}(\text{OH})_2$ , (A), by interaction of  $\text{H}_3\text{AsO}_4$  and  $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ , an intermediate addition product,  $\text{NH}_2\text{C}_{10}\text{H}_7\cdot\text{H}_3\text{AsO}_4$ , acid  $\alpha$ -naphthylamine arsenate (B), was obtained by the authors. Mix equal wts. of  $\text{C}_{10}\text{H}_7\text{NH}_2$  and  $\text{H}_3\text{AsO}_4$  and cryst. from hot  $\text{H}_2\text{O}$ , recryst. from hot EtOH, drain and dry at 100°. (B) forms long colorless needles, m. 170°, turning dark purple at 165°. It is acid to litmus, non-deliquescent in air, but turning purple while retaining its cryst. form. It is little sol. in  $\text{Et}_2\text{O}$  and benzene, sol. in concd.  $\text{H}_2\text{SO}_4$ , but not

reppd. by  $H_2O$ . Alkalies ppt.  $C_{10}H_7NH_2$ ,  $AgNO_3$  ppts.  $Ag_3AsO_4$ . Detn. of As and N confirm its compn. Detn. of the mol. wt. by the b. p. method with abs. EtOH shows that dissociation takes place in this solvent. No other compd. seems to be formed in this reaction, even with an excess of base used. To obtain if possible the di(aminonaphthyl)arsinic acid, 2.25 parts (B) were added with vigorous stirring to 1 part of  $\alpha-C_{10}H_7NH_2$ , previously melted (about  $60^\circ$ ). The mixt. was then rapidly heated for a short time to  $200^\circ$  in an oil bath, forming a purple tar. The NaOH ext. of the tar, after distg. off the unchanged base, gave with dil.  $HNO_3$  a small amt. of (A), an amphoteric substance, persistently retaining its pink color. A concd.  $H_2SO_4$  soln. of the tar was pptd. with  $H_2O$ , forming a purple powder. When purified by repeated treatment with boiling  $H_2O$  and hot EtOH, it has the compn.  $C_{12}H_{11}NO$ , hence it is an oxidation product of the reaction. It is sparingly sol. in EtOH with violet color, sol. in  $Et_2O$ ,  $CS_2$ ,  $CHCl_3$  and  $AcOEt$ , insol. in dil. acids and alkalies, not reduced by  $SO_2$ .

S. WALDBOTT.

The constitution of dynopinacone and its derivatives. M. DELACRE. *Ann. chim.* 10, 101-37(1918).—This is the fifth of a series of publications on this subject. The first (C. A. 8, 3420) and second (C. A. 10, 2580) have appeared; the third and fourth have been left in occupied territory and cannot be recovered before the end of the war. The substances under investigation are divided into three classes: (A) Dynopinacolines, further divided into albo-dyp. and luteo-dyp., (B) photodynopinacolines; (C) dynopinacones, of which six are known. Alkalies convert all of the latter into albo-dynopinacolines. AcOH converts the homo-dynopinacones into the homo-dynopinacolines. Sunlight converts albo-dynopinacolines into photo-dynopinacolines- $\beta$ . The relationships are shown by the scheme:



Structural formulas and an exhaustive discussion are included. JAMES F. COUCH.

Alkaloids of *Holarhena conchensis*, Stapf. FRANK L. PYMAN. *J. Chem. Soc.* 115, 163-6(1919).—In an examn. of this plant in 1913, the author isolated a new base *holarrheminine*,  $C_{24}H_{34}ON_2$ , together with the alkaloid conessine, which had been obtained previously by several authors from other species of *Holarhena*. The physiol. action of these 2 alkaloids was studied by Burn (cf. C. A. 9, 659), who found that while they had a local anesthetic action, this property was of no practical value on account of the local necrosis produced on subcutaneous injection. The observations made by P. on conessine are for the most part in agreement with the recent work of Giemsa and Halberkann (*Arch. Pharm.* 256, 201(1918)), and confirm the formula  $C_{24}H_{34}N_2$  supported by these authors, not that— $C_{28}H_{38}N_2$ —put forward by Ulrici (*Arch. Pharm.* 256, 57(1918)). Giemsa and Halberkann's view that conessine contains 2 dialkylamino groups is not shared by P., who found conessine to contain only 3 alkyl groups (no doubt Me) attached to the N atom. Moreover, Polstorff and Schirmer (*Ber.* 19, 84(1886)) showed that conessine dimethohydroxide yields, on heating, a cryst. base, to-



gether with "ammonia" (doubtless  $\text{NMe}_3$ ). It is therefore probable that conessine contains an *N*-Me group forming a link in a heterocyclic ring, to which a side-chain bearing a  $\text{NMe}_2$  group is attached. Holarrhenine resembles conessine in containing 3 *N*-alkyl groups. It yields a monoacetyl derivative,  $\text{C}_{24}\text{H}_{40}\text{O}_2\text{N}_3$ , which is diacidic, whence it follows that holarrhenine contains a OH group. Conessine hydrogen oxalate,  $\text{C}_{24}\text{H}_{40}\text{N}_3 \cdot 2\text{C}_2\text{H}_2\text{O}_4$ , forms prisms m.  $280^\circ$  (decompn.). The free base gave the constants:  $\alpha_D -0.28^\circ$ ,  $c = 7.268$ ,  $l = 2$  dcm.,  $[\alpha]_D -1.90^\circ$ . Holarrhenine,  $\text{C}_{24}\text{H}_{38}\text{ON}_3$ , silky needles, m.  $197-8^\circ$ . The sp. rotatory power in  $\text{CHCl}_3$  is:  $\alpha_D -0.75^\circ$ ,  $c = 5.248$ ,  $l = 2$  dcm.,  $[\alpha]_D -7.1^\circ$ . The hydrobromide,  $\text{C}_{24}\text{H}_{38}\text{ON}_3 \cdot 2\text{HBr} \cdot 3\text{H}_2\text{O}$ , flat needles, m.  $265-8^\circ$ , loses  $\text{H}_2\text{O}$  of crystn. at  $100^\circ$ . Acetylholarrhenine,  $\text{C}_{26}\text{H}_{40}\text{O}_2\text{N}_3$ , oblong plates, m.  $180^\circ$ . W. O. E.

Lactone acids which were derived from anethole. J. TAKEDA AND S. KURODA. *Yakugaku-Zasshi* (J. Pharm. Soc. Japan) No. 443, 1-20(1919).—The reaction products of 1 mol. of anethole bromohydrin obtained by the action of  $\text{H}_2\text{O}-\text{Me}_2\text{CO}$  on dibromoanethole (*Ber.* 38, 3470(1905)) and 1 mol. of  $\text{CHNa}(\text{CO}_2\text{Et})_3$ , sapond. with alc. KOH, and allowed to stand for 1 month, is  $\gamma$ -*p*-methoxyphenyl- $\gamma$ -methylbutyrolactone- $\alpha$ -carboxylic acid,  $\text{C}_{12}\text{H}_{14}\text{O}_6$ , which seps. from the soln. in white crystals, recrystd. from 20% alc., m.  $119^\circ$ , insol. in ligroin and  $\text{CS}_2$ . The formation of the acid is represented as follows:  $\text{MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CHBrMe} + \text{NaCH}(\text{CO}_2\text{Et})_3 \rightarrow \text{MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CHMe} \cdot \text{CH}(\text{CO}_2\text{H})_2 \rightarrow$



. From the mother liquor anisace-

tone was also isolated. However, by the interaction of 1 mol. dibromoanethole and 2 mols. of the ether,  $\beta$ -*p*-methoxyphenyl- $\gamma$ -methylbutyrolactone- $\alpha$ -carboxylic acid, m.  $161^\circ$ , was obtained. The mechanism of the formation of the  $\beta$ -lactone acid, is explained by assuming that the Br in the  $\alpha$ -position of dibromoanethole is more reactive than that in the  $\beta$ -position (Pond, *J. Am. Chem. Soc.* 24, 327; 25, 262; Höring, *Ber.* 38, 3446), T. and K. have observed that 2-*p*-methoxyphenyl-3-methyltrimethylenecarboxylic acid,  $\text{C}_{12}\text{H}_{14}\text{O}_6$ , m.  $134^\circ$ , was formed simultaneously with the  $\beta$ -lactone acid; it is sol. in ligroin and  $\text{CS}_2$  and crystals in silky needles from 50% alc. On heating the  $\beta$ -lactone acid to its m. p., it decomps. into  $\text{CO}_2$  and  $\beta$ -*p*-methoxyphenyl- $\gamma$ -methylbutyrolactone,  $\text{C}_{12}\text{H}_{14}\text{O}_5$ , m.  $90^\circ$ , soluble in hot  $\text{H}_2\text{O}$  and ligroin. The lactone acid by the action of HI yields  $\beta$ -*p*-hydroxyphenyl- $\gamma$ -methylbutyrolactone- $\alpha$ -carboxylic acid,  $\text{C}_{12}\text{H}_{12}\text{O}_6$ , m.  $178^\circ$ , insol. in ligroin, sol. in cold  $\text{H}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{Et}_2\text{O}$ ,  $\text{CHCl}_3$ , from which  $\beta$ -*p*-acetoxyphenyl- $\gamma$ -methylbutyrolactone,  $\text{C}_{12}\text{H}_{14}\text{O}_6$ , m.  $81^\circ$ , and  $\beta$ -*p*-hydroxyphenyl- $\gamma$ -methylbutyrolactone,  $\text{C}_{11}\text{H}_{12}\text{O}_5$ , m.  $109^\circ$ , were obtained by the action of  $\text{Ac}_2\text{O}$  and by heating, resp. S. KOMATSU.

Urushiol, the main constituent of Japanese lac. VII. R. MAJIMA, R. TAHARA, G. TAKAYAMA, T. WATANABE AND Y. OKAZAKI. *Tokyo Kwagaku Kwaishi* (J. Tokyo Chem. Soc.) 40, 1-41(1919).—The present study on the oxidation of the Me ether and Ac derivs. of urushiol by  $\text{O}_3$  and  $\text{KMnO}_4$ , contributes to the knowledge of the constitution of urushiol. Tahara has prepd. diacetylurushiol,  $b_0$ ,  $212-20^\circ$ , from crude urushiol and  $\text{Ac}_2\text{O}$ , and purified it by fractional distn. *in vacuo*. The ozonide of the ester prepd. by passing ozonized  $\text{O}$  (3 %) into the  $\text{CHCl}_3$  soln., was decompd. by hot  $\text{H}_2\text{O}$ , yielding  $\text{AcH}$ ,  $\text{Me}(\text{CH}_2)_3\text{CHO}$ ,  $\text{Me}(\text{CH}_2)_3\text{CO}_2\text{H}$ , azelaic acid and a substance,  $\text{C}_{11}\text{H}_{20}\text{O}_6$ ,  $b_1$   $205-7^\circ$ , containing 2 Ac groups in the mol. and giving azelaic acid on oxidation with  $\text{KMnO}_4$ . Diacetylhydrouushiol, m.  $51^\circ$ , was isolated from the soln. of ozonized diacetylurushiol, and its compn. confirmed by analysis and mol. wt. detn. Monoacetylhydrouushiol methyl ether, m.  $45-6^\circ$ , was also isolated by Takayama from the filtrate from acetylurushiol methyl ether ozonide, pptd. by adding petr. ether to its chloroform soln. These facts lead the authors to the notion that crude urushiol contains hydrouushiol. Takayama has prepd. pure acetylurushiol methyl ether from the monomethyl ether

purified by fractional distn. *in vacuo* and  $\text{Ac}_2\text{O}$  and transformed into its ozonide. The ozonide purified by pptn. was decompd. by hot  $\text{H}_2\text{O}$ , yielding  $\text{Me}(\text{CH}_2)_6\text{CHO}$ ,  $\text{Me}(\text{CH}_2)_6\text{CO}_2\text{H}$ ,  $\text{AcO}(\text{MeO})\text{C}_6\text{H}_5(\text{CH}_2)_6\text{CHO}$ ,  $b_{78}$ , 190–210°, and a cryst. substance,  $\text{MeO}(\text{OH})\text{C}_6\text{H}_5(\text{CH}_2)_6\text{CO}_2\text{H}$ , m. 49–50°, needles from petr. ether, sol. in alc.  $\text{Et}_2\text{O}$ ,  $\text{Me}_2\text{CO}$ ,  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_6$  and  $\text{AcOEt}$ . On the other hand, W. has succeeded in obtaining  $\text{Me}(\text{CH}_2)_6\text{CHO}$ ,  $\text{HCO}_2\text{H}$ , adipic acid,  $(\text{CO}_2\text{H})_2$ ,  $(\text{MeO})_2\text{C}_6\text{H}_5(\text{CH}_2)_6\text{CO}_2\text{H}(?)$  and veratrol-*o*-carboxylic acid, m. 121–2°, from the oxidation product obtained by the action of  $\text{KMnO}_4$  on an emulsion of urushiol dimethyl ether. The isolation of both veratrol-*o*-carboxylic acid and  $\text{MeO}(\text{OH})\text{C}_6\text{H}_5(\text{CH}_2)_6\text{CO}_2\text{H}$  from urushiol by oxidation, gives strong support to the constitution of urushiol proposed by M. W. obtained  $\text{AcH}$ ,  $\text{Me}(\text{CH}_2)_6\text{CHO}$  and  $\text{HCO}_2\text{H}$  from the oxidation product of urushiol dimethyl ether by  $\text{O}_3$ . However, repeating the same expt. with pure ether,  $\text{HCHO}$ ,  $\text{Me}(\text{CH}_2)_6\text{CHO}$ ,  $\text{CO}_2$  and  $\text{HCO}_2\text{H}$  were obtained but not  $\text{AcH}$ . According to the results of the oxidation of the derivs. of urushiol by  $\text{O}_3$  and  $\text{KMnO}_4$ , urushiol,  $(\text{OH})_2\text{C}_6\text{H}_5\text{C}_{11}\text{H}_{27}$ , is probably a mixt. of the following substances:  $(\text{HO})_2\text{C}_6\text{H}_5(\text{CH}_2)_7\text{CH}:\text{CH}(\text{CH}_2)_6\text{Me}$ ,  $(\text{HO})_2\text{C}_6\text{H}_5(\text{CH}_2)_7\text{CH}:\text{CH}(\text{CH}_2)_4\text{CHCH}_3$ , or  $(\text{OH})_2\text{C}_6\text{H}_5(\text{CH}_2)_7\text{CH}:\text{CHC}_6\text{H}_5\text{CHCH}_3$ . The different behavior of Br toward urushiol dimethyl ether and stearic acid observed by W. and O, also supports the view that urushiol contains double bonds in its mol. Studying the fraction  $b_{11}$  130–137° of urushiol dimethyl ether, an unsatd. hydrocarbon named *urusene* was isolated by Takayama. The results of its analysis, mol. wt. detn., and its chem. properties agree with the formula  $\text{C}_{14}\text{H}_{28}$  or  $\text{C}_{14}\text{H}_{30}$ . S. KOMATSU.

**Preparation of certain organic salts of tellurium.** AARON M. HAGEMAN. *J. Am. Chem. Soc.* 41, 342–6(1919).— $\text{Te}(\text{HC}_4\text{H}_9\text{O}_6)_4$  is best prepd. by a prolonged heating of  $\text{TeO}_3$  with a satd. soln. of tartaric acid at 70° until *all* the  $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$  is used up. It is impossible to sep.  $\text{Te}(\text{HC}_4\text{H}_9\text{O}_6)_4$  from  $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$  by crystn. because they have nearly the same soly. Boiling the salt causes a slow but complete sepn. of Te. *Tellurium acid citrate*,  $\text{Te}(\text{HC}_4\text{H}_9\text{O}_7)_3$  is produced by the action of a concd. soln. of citric acid on  $\text{TeO}_3$ . It crysts. in white, opaque, radiating crystals, withstands boiling temps. without reduction, and may be sepd. from the free acid by fractional crystn. Succinic acid does not attack  $\text{TeO}_3$ . Oxalic, lactic, malic, and gallic acids hold appreciable amts. of  $\text{TeO}_3$  in soln., but it was impossible to sep. a cryst. compd. of Te with any of these acids. The existence of an oleate or stearate of Te is shown to be doubtful. Cf. C. A. 13, 936. R. H. LOMBARD.

**Total synthesis of linalool.** L. RUZICKA AND V. FERNANDEZ. *Helvetica Chim. Acta* 2, 182–8(1919).—As is perhaps known, all methods hitherto employed in the artificial prepn. of linalool are based upon reactions involving mol. rearrangement. In the present investigation this alc. was obtained by recourse to the reaction discovered by Nef (cf. *Ann.* 308, 264) whereby condensations are effected between ketones and compds. of Na acetylide. Thus, on treating methylheptenone in abs.  $\text{Et}_2\text{O}$  with Na amide followed by satn. with  $\text{C}_6\text{H}_6$ , *dehydrolinalool*,  $\text{C}_{10}\text{H}_{16}\text{O}$ , a watery liquid,  $b_{11}$  91–3°, (*phenylurethan*,  $\text{C}_{17}\text{H}_{21}\text{O}_2\text{N}$ , fine, brilliant needles, m. 88°) resulted. On reduction in moistened  $\text{Et}_2\text{O}$  with Na, linalool,  $b_{11}$  86–8° and  $b_{70}$  194–7°, was obtained, having  $d_{18}$  0.8649 and 0.8654, and yielding a phenylurethan, m. 63–5°. This synthesis corroborates the formula for linalool,  $\text{Me}_3\text{C}:\text{CHCH}_2\text{CH}_2\text{CMe}(\text{OH})\text{CH}:\text{CH}_2$ , as advocated by Tiemann and Semmler (*Ber.* 28, 2126). W. O. E.

**A chart of organic chemistry, aliphatic series.** ALEXANDER LOWY. *Science* 49, 314(1919).—The chart is for teaching purposes. E. J. C.

**II-10-Bromophenanthrene-3(or 6)-sulfonic acid.** HÅKAN SANDQVIST. *Ann.* 417, 1–16(1918).—See C. A. 12, 807. E. H.

**I-10-Chlorophenanthrene-3(or 6)-sulfonic acid and 10-chlorophenanthrene.**  
**HÅKAN SANDQVIST.** *Ann.* 417, 17-33(1918).—See C. A. 12, 807. E. H.

Preparation of organic chlorostannites and -stannates (DRUCE) 6. Electrolysis of fused sodium and potassium amides (WÖHLER, STANG-LUND) 4. Distillation of ovalbumin (PICTET, CRAMER) 11A. Still for "mustard gas" (STREETER) 1. Glyceryl methyl ether dinitrate (JONES) 24.

**Chlorinating naphthalene.** K. BROWN. U. S. 1,294,230, Feb. 11. The pat. relates to an app. in which  $C_{10}H_8$  is chlorinated by the action of a current of Cl passed through a series of steam-jacketed pots in which the  $C_{10}H_8$  is held.

**Chlorinating hydrocarbons of the paraffin series.** H. T. BOYD. U. S. 1,293,012, Feb. 4. Chlorination of hydrocarbons of the paraffin series such as pentane is carried out in 2 stages. In the first stage, the hydrocarbon is treated in the liquid state with Cl and the vapors given off from this stage (which consist almost wholly of unconverted hydrocarbon, Cl and HCl comparatively free from chlorinated hydrocarbons) are then further treated with Cl in a sep. reaction vessel. The method is designed to obtain a max. yield of monochloro derivs. and may be carried out continuously in an app. which is illustrated and described in the pat. The satn. of monochloro compds. in both the liquid-phase and vapor-phase chlorinations is preferably kept below 25% by suitable regulation of the supply of Cl and hydrocarbon and of the rate at which the products are fed from the chlorination chamber to a still wherein they are fractionated, to prevent, so far as possible, the formation of di- and trichloro compds.

**Purifying anthraquinone.** H. F. LEWIS and H. D. GIBBS. U. S. 1,293,610, Feb. 4. Crude anthraquinone is freed from impurities such as anthracene, by treatment, while in the solid state, with finely divided Fe and a hot alk. soln. such as alc.,  $H_2O$  and NaOH, followed by filtration and reoxidation of the reduced anthraquinone. The pat. is dedicated to the public for free use.

**Acetone and alcohol by fermentation.** J. H. NORTROP. U. S. 1,293,172, Feb. 4. *Bacillus aceto-ethylicum* is used for producing acetone and alc. by the fermentation of carbohydrates. The following yields of acetone are obtained from various materials fermented: galactose 4-5%, maltose 6-7%, mannose 6-7%, raffinose 8-10%, *d*-arabinose 6-7%, starch 8-10%, beet molasses 8-10%, potatoes 2-4%, dextrin 6-7%, dextrose 9-10%, levulose 8-10%, xylose 4-5%, sucrose 8-9%, corn 10-13%, corn cobs 1-5%, horse chestnuts 7-8%. In fermenting these materials there is simultaneously produced a yield of alc. usually averaging about 3-5 times the amt. of the acetone formed. Glycerol, fermented with *B. aceto-ethylicum*, yields 40-43% alc. The materials to be fermented may be formed into a mash with 10-50 times their weight of  $H_2O$ , a small amt. of nitrogenous material and a "buffer substance" such as  $CaCO_3$  or Na phosphate, which is added after preliminary sterilization, to prevent the mash from becoming acid. The charge thus prepd. is allowed to ferment for 4-8 days, and after the products are drawn off from the fermentation vessel to a still, a fresh charge is placed in the fermenting vessel and allowed to ferment by the action of the bacilli adhering to the walls of the vessel. This second and succeeding fermentations are somewhat more rapid than the first fermentation, being completed in 40-60 hrs. In fermenting molasses, marble chips may be placed in the fermenting vessel to serve instead of any other "buffer substance."

**Camphylcarbinol.** HANS RUPE. Ger. 307,357, 1918. Hydroxymethylene-camphor only suffers reduction at the ethylenic bond when reduced by H in the presence of finely divided Ni or Co in alc., aq.-alc., or HOAc soln., or as normal alk. salt in

aq. soln.; camphylcarbinol, which is thus produced, is a colorless, odorless oil, b. 142-3° at 10 mm.,  $d_4^{20}$  1.0502.

4-Sulfoaminobenzene-2-carboxylic (6-amino-*m*-sulfobenzoic) acid. BAYER & Co. Ger. 307,284, addition to 296,941, 1918 (C. A. 13, 322). 6-Amino-*m*-sulfobenzoic acid is conveniently prepd. by the action of mol. amts. of chlorosulfonic acid and anthranilic acid dissolved in  $H_2SO_4$  monohydrate. The mixt. is slowly heated to 90-100°, and subsequently to 130-140° after evolution of HCl has ceased. Under these conditions, the monohydrate has practically no sulfonating action.

Ethyl acetate from acetaldehyde. FARBERWERKE VORM. M. L. & B. Ger. 308,043, 1918. The process depends on the use of a soln. of  $Al(OEt)_3$ , which contains at the most only traces of halogen compds., in an org. solvent of high b. p., such as solvent naphtha. With such solns., which allow the most favorable temp. to be readily maintained, the yield of practically pure  $EtOAc$  exceeds 85% of that theoretically possible; at the same time, the duration of the action is considerably decreased, and the consumption of  $Al(OEt)_3$  is reduced to 3-5% of the  $CH_3CHO$ .

## II. BIOLOGICAL CHEMISTRY.

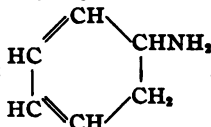
HATTIE L. HEFT AND WILLIAM J. GIES.

### A. GENERAL.

FRANK P. UNDERHILL.

Distillation of ovalbumin under diminished pressure. A. PICTET AND M. CRAMER. *Helvetica Chim. Acta* 2, 188-95 (1919).—The operation was carried out in a Cu retort under a pressure of 20-22 mm. with a charge of 4 kg. of commercial egg albumin. With a gradual increase of temp. ranging from 70 to 350°, the products obtained were  $H_2O$  30%,  $H_2O$ -sol. and -insol. org. substances 15%, coke 32%, gases and loss 23%. The org. substances were entirely sol. in  $Et_2O$ , being subsequently sepd. therefrom by successive treatment into acid, basic and neutral portions. Among the acids identified were  $AcOH$ ,  $EtCO_2H$ , butyric and succinic acids. The basic portion yielded on distn. fractions possessing the odor characteristics of the pyrrolines. One of the fractions appeared to be homogeneous, giving an abundant ppt. with picric acid (yellow needles m. 185°), and is tentatively regarded as being the primary base (*dihydroaniline*, and

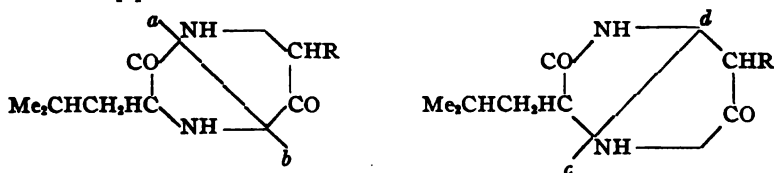
having the constitution:



This formula would seem to explain the

presence of aniline and benzene in certain tars (*d'huile animale de Dippel*). The neutral substances arising from the distn. yielded on fractionation for the most part crystalline products, notably isobutylacetamide, m. 120°, which result leads the author to the following reasoning: (1) Weidel and Ciamician have identified isobutylacetoneitrile as one of the main constituents of animal oil (*l'huile animale*), but they attribute its formation to a reaction of  $NH_3$  on fats contained in the animal tissues. The present work indicates that it is indeed a product of the decompn. of albumin, but a secondary one; the primary product is the amide which can be isolated under reduced pressure, but which under a more elevated temp. and pressure loses a mol. of  $H_2O$ . (2) If one compares the formula of isobutylacetamide,  $Me_2CHCH_2CH_2CONH_2$ , with that of leucine,  $Me_2CHCH_2CH(NH_2)CO_2H$ , which forms the most abundant product in the hydrolytic decompn. of proteins, one finds a certain analogy. While these 2 substances are derived one from the other, it appears probable that both have their rise in the same

atomic grouping. Such common source is readily explained if the grouping in question is constituted, as the investigations of E. Fischer have rendered extremely probable, in a diketopiperazine-like combination:



If the ring is split at the line *ab* by hydrolysis or at *cd* by heat, either leucine or isobutyl acetamide would result. On washing the crystals of isobutylacetamide with petr. ether, there resulted on evapn. an oily residue in which was identified both acet- and propionamide. Among the higher boiling fractions of neutral products indole was detected (by its picrate).

W. O. E.

**Influence of neutral salts on the action of salivary amylase.** J. T. GROLL. *Arch. néerland. physiol.* 2, 516-20(1918); *Physiol. Abstracts* 3, 407(1918).—Study was made of the influence of various neutral salts on the activity of ptyalin (salivary amylase), taking the first appearance of the red color or erythro-dextrin as the end-point of the reaction. The influence of anions was greater than that of cations. With the chlorides the accelerating action of the cations was:  $\text{Na} < \text{NH}_4 < \text{K}$  and  $\text{Sr} < \text{Ba} < \text{Mg} < \text{Ca}$ ; this corresponded with the series as found in colloid chemistry. Of the anions, halogen activated, sulfates and nitrates inhibited; the series corresponded but partially with that of colloid chemistry. Neutral salts apparently influence other factors than the degree of dispersion of the enzyme.

JOSEPH S. HEPBURN.

**Studies on Pikelharing's pepsin. IV.** W. E. RINGER. *Arch. néerland. physiol.* 2, 571-93(1918); *Physiol. Abstracts* 3, 408(1918).—Pepsin is always negatively charged, and has no isoelectric point, thereby differing from other albuminoid substances. Pure pepsin is combined with an albumin-like substance which travels to the cathode. The action of pepsin on albumin is governed at first by the amt. of swelling of the latter; sulfates, etc., inhibit proteolysis by hindering this swelling or imbibition. The elec. charge of the albumin is closely related to the degree of imbibition, and probably is the determining factor during the later stages of digestion, since an opposite charge favors the combination of enzyme and substrate. The degree of digestion was detd. by pptn. with tannic acid in the presence of a definite concn. of salts, and detn. of non-pptd. N in the filtrate. Albumin of dialyzed serum was used; the H-ion concn. of the soln. was detd. during digestion; the control was a soln. of the same compn. containing inactive pepsin. "Similar expts. with hetero-, deutero-, and proto-albumose showed that the plateau representing max. activity was much more prolonged when the recent products of demolition were concerned (albumose v. albumin). The plateau was reached with a lower acidity and the ascent of the curve was much slower; the condition was more pronounced in deutero- than in proto- or heteroalbumose." The ferrocyanogen anion only combines with the positive charged albumin ion; therefore addition of  $\text{K}_4\text{FeC}_6\text{N}_6$  inhibited the proteolysis of dialyzed horse serum by pepsin;  $\text{KCl}$  and  $\text{K}_2\text{SO}_4$  exerted a slight inhibiting action only in higher concns.; these results support the theory that the charge on the substrate is important in the action of pepsin.

JOSEPH S. HEPBURN.

**Enzymes and surface action.** W. M. BAYLISS. *Arch. néerland. physiol.* 2, 621-4(1918); *Physiol. Abstracts* 3, 406-7(1918).—The following expts. were based on the hypothesis that the action of enzymes as heterogeneous catalysts consists in the condensation on their surfaces by adsorption of the constituents of the reacting systems

including water. The enzyme used was soy bean urease. Saponin exerted a retarding action, probably due to its degree of adsorption, and to its ability to replace the substrate on the surface of the enzyme. From a soln. containing saponin and urea, charcoal adsorbed saponin to the exclusion of a large amt. of urea. Saponin retarded the cleavage of urea by urease as was shown by the change in elec. cond.; but hydrolysis attained the same point in 24 hrs. in both the presence and the absence of saponin. Both surface energy and adsorption have a negative temp. coeff.; the inhibiting effect of saponin was greater at 0° than at 40°, hence was due to adsorption. The temp. coeff. of the reaction was also changed by saponin.

JOSEPH S. HEPBURN.

Rudolph Kobert. ERNST SIEBURG. *Chem. Ztg.* 43, 25-6(1919).—Obituary.

E. H.

**Mucins and mucoids.** P. A. LEVENE AND J. LÓPEZ-SUÁREZ. Rockefeller Inst. *J. Biol. Chem.* 36, 105-26(1918).—There is a chem. distinction between the two types of conjugated sulfuric acids obtained from mucins and mucoids of different origins; the one, chondroitin- $H_2SO_4$ , contains the nitrogenous hexose, chondrosamine, and the other, mucoitin- $H_2SO_4$ , yields chitosamine. The former is found in the mucoids isolated from cartilage, tendons, aorta and sclera and the latter from (A) funis mucin, humor vitreous, and cornea and (B) mucin of gastric mucosa, serum mucoid, ovomucoid, and ovarian cysts. Chondroitin- $H_2SO_4$  is comparatively resistant toward hydrolytic agents and can be obtained in a fair degree of purity but mucoitin- $H_2SO_4$  is always mixed with mucoitin when prepd. free from protein. The intermediary substance, chondrosin, is readily prepared in a pure state whereas mucosin is so labile that it is almost completely hydrolyzed under conditions which permit the prepn. of chondrosin. When mucoitin- $H_2SO_4$  is subjected to milder hydrolysis the mucosin formed contains undecompd. mucoitin. Differences were observed between the different members of the mucoitin- $H_2SO_4$  group and it is probable that the acids of this group belong to 2 types, the one being obtained from the substances in group (A) and the second from group (B). The first is characterized by being pptd. by comparatively small amts. of glacial AcOH as a gelatinous ppt. and by the readiness with which it forms an insol. Ba salt, very sparingly sol. in  $H_2O$  but readily sol. in the presence of acetates. The second type forms a Ba salt of greater soly., requires a large excess of glacial AcOH for pptn. and forms a flocculent rather than a gelatinous ppt. When  $H_2SO_4$  is removed from mucoitin- $H_2SO_4$  a substance is formed which is analogous to chondroitin. It is non-reducing and does not contain free amino groups. It forms mucosin on hydrolysis, which is a disaccharide composed of glucuronic acid and chitosamine. Mucoitin, like chondroitin, contains one acetyl group to each mol. of chitosamine, glucuronic and sulfuric acids. The glucuronic acid could be identified with a greater degree of exactness in the acids of the funis mucin type. A suggested graphic formula for mucoitin- $H_2SO_4$  is given.

A. P. LOTHROP.

**The stability of esterase in ground liver preserved in glycerol.** J. P. SIMONDS. *Am. J. Physiol.* 48, 141-5(1919).—Ground liver preserved in glycerol may retain its esterolytic power unimpaired for periods up to 24 months at least. In some cases there is even an increase in the activity of the clear filtered ext., due probably to autolysis of the liver cells with liberation of the esterase. In some cases a diminution of esterase might have been due to the large amt. of bile present (e. g., in livers from P-poisoned dogs).

J. F. LYMAN.

**Stimulation by the outward diffusion of an electrolyte.** W. D. ZORTHOUD. *Am. J. Physiol.* 48, 161-70(1919).—Expts. reported are interpreted to show that  $BaCl_2$  does not stimulate muscle by its mere presence in the irritable structure but rather by its active diffusion into or out of the tissue. The stimulating effect of  $BaCl_2$  is counteracted by KCl,  $NH_4Cl$ ,  $CaCl_2$  and  $MgCl_2$ . NaCl increases the effect of  $BaCl_2$ .

J. F. L.

**The catalytic power of blood and solid tissue.** F. C. BRIGHT. *Am. J. Physiol.* 48, 171-91(1919).—Since the catalase of the blood in the same species under the same conditions varies enormously (100 to 1000%) it is believed that Burge and others are unjustified in using catalase values of the blood as a measure of oxidation in the animal. Thyroid feeding produced in cats a slight fall in blood catalase as opposed to the increase reported by Burge. There was no parallelism between activity and blood catalase; indeed several very active animals were noted with very low blood catalase. Satisfactory determinations of catalase in solid tissues cannot be made by any method yet described owing to the slow and long-continued evolution of O from  $H_2O_2$  in the presence of solid organs. Catalase power of the blood is confined to the corpuscles and is not influenced by the O-carrying power of the blood. Ether anesthesia causes a slight increase in blood catalase. J. F. LYMAN.

**The function of the nucleus of the living cell.** VERNON LYNCH. *Am. J. Physiol.* 48, 258-83(1919).—An ameba deprived of its nucleus may exhibit normal movements. Such an ameba lives only as long as a normal starving ameba. It is benefitted slightly by the addition of dextrose to the nutrient media, but is injured by simple N compds., such as urea, while the normal organism appears to utilize urea N in synthesizing protoplasm. The enucleated cell may move, respire, digest, respond to stimuli and exhibit any activity which is dependent solely upon catabolic or destructive processes of protoplasm. The group of phenomena which it never shows are those of growth and of regeneration and division, *vis.*, those depending upon organic synthesis. There is no evidence that oxidation is interfered with in enucleated cells. J. F. LYMAN.

**Decrease of permeability and antagonistic effects caused by bile salts.** W. J. V. OSTERHOUT. *J. Gen. Physiology* 1, 405-8(1919).—Na taurocholate produced a decrease in permeability and antagonized the effect of NaCl which normally produces an increase in permeability. This confirms the hypothesis that antagonistic relations as regards permeability can be predicted from a study of the permeability of pure substances. The plant, *Laminaria*, was largely used in these expts.

CHAS. H. RICHARDSON.

**A comparison of permeability in plant and animal cells.** W. J. V. OSTERHOUT. *J. Gen. Physiology* 1, 409-13(1919).—The plant tissue chiefly used was from *Laminaria*; the animal tissue was the skin of the frog, *Rana pipiens*. Quant. studies were made on the permeability of these tissues in sea water solns. to which were added  $CaCl_2$ , NaCl,  $LaNO_3$ ,  $MgCl_2$ , HCl, KCl,  $Et_2O$ ,  $CHCl_3$ ,  $CCl_4CH(OH)$ , or EtOH with the result that a striking agreement was found in certain important aspects of permeability, antagonism, injury, recovery and death.

CHAS. H. RICHARDSON.

**Bioelements: The chemical elements of living matter.** INGO W. D. HACKH. *J. Gen. Physiology* 1, 429-33(1919).—Of the 87 known elements, 34 have been found to enter into living matter. Seventeen of these seem to be essential to life and not more than 4 constitute 97-99% of the living organism. The majority of the bioelements are of low atomic wt., belonging to the first 2 periods of the periodic system. Oxygen is the only one which enters into the living organism as an element; all others occur only in compounds. The 1st 16 elements found in the mammal (man) named in the descending order of their percentage occurrence are: O, C, H, N, Ca, P, K, S, Cl, Na, Mg, I, F, Fe, Br, and Al. Those for the plant (Gymnosperm) are: C, O, H, Al, Si, S, Fe, N, Ca, K, P, Mg, Cl, Na, F, and Mn. Ti occurs in traces in nearly all plants; its physiological functions are little known. From 60 to 80% of the known elements are of a more or less poisonous character to organisms. The order of the occurrence of elements in the gaseous, liquid and solid spheres is given for comparison.

CHAS. H. RICHARDSON.

## B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Tests of a new pregnancy reaction, similar to that of Kottmann. PAUL HÜSSY. *Cor.-bl. f. Schweiz. Aerzte, Basel* 48, 733-42(1918); *Abstracts of Bacteriology* 2, 254.—The technic of the reaction is much the same as with the Fe-placenta method of Kottmann, although H. thinks that the modified reaction employing a Cu-placenta compd. is more reliable. E. J. C.

The question of the preparation of Teichmann hemin crystals. N. BOKARIUS. *Viertelg. f. gericht. Med.* 55, 255-9(1918); *Physiol. Abstracts* 3, 501.—By adjusting the proportion between the AcOH and a concd. aq. soln. of NaCl as laid down fully in the paper, hemin crystals of large size can be rapidly obtained. E. J. C.

Medico-legal study of adrenaline content of suprarenals. O. SAMPARIO. *Brasil-Medico* 32, 81(1918); *Physiol. Abstracts* 3, 386.—Tests for detg. whether death has occurred suddenly or not. E. J. C.

Determination of the nitrogen-methyl in the blood. A. KOSSEL AND S. EDL-BACHER. *Arch. nêerland. physiol.* 2, 625-8(1918); *Physiol. Abstracts* 3, 427(1918).—E.'s micro-method for detn. of N-bound alkyl was found applicable for detn. of the N-Me of the blood, and was used in a series of normal and pathological cases. A micro-Kjeldahl method was used for the detn. of the N. JOSEPH S. HEPBURN.

Phenolphthalin as a test for occult blood in feces. S. YAOITA AND M. HINO. *Chugai Iji Shimpô* 903, 1306-10(1917); *Jap. Med. Literature* 4, 9-10(1919).—The phenolphthalin is prepd. from phenolphthalein by use of Zn powder and aq. soln. of KOH. This test for occult blood is sensitive to 1 part in 1,000,000, when an AcOH-alc. ext. of the feces is used. JOSEPH S. HEPBURN.

New experimental method for the qualitative and approximately quantitative determination of protein in cerebrospinal fluid. PAUL KIRCHBERG. *Deut. med. Wochschr.* 44, 657(1918).—A pathologic increased protein content of the cerebrospinal fluid is detected qualitatively by thoroughly mixing several drops of the fluid and an equal vol. of 0.5% aq. soln. of thiosalicylic acid in a small tube; formation of a cloud reveals the pathologic increase. For the quant. detn., 2 cc. of the cerebrospinal fluid and 1 cc. of 1% aq. soln. of thiosalicylic acid are mixed in a suitable centrifuge tube and permitted to stand for 15 min.; an opalescence is normal; the tube is then subjected to centrifugation until the ppt. attains a constant vol.; 20 min. is the usual time required; an opalescence of the supernatant liquid is without significance. By comparisons with ppts. obtained by this procedure from known concns. of sera, the % of protein can be detd. If Nissl tubes be used in the centrifuge, a ppt. to the precipitate level (Bodensatzhöhe) corresponds to the normal content of 0.02% protein, a ppt. to the half-division to 0.04% protein (pathologic increase). JOSEPH S. HEPBURN.

Clinical importance of fecal examination in pediatric practice. C. S. RAUE. *Hahnemannian Monthly* 54, 212-9(1919).—Chem. methods for the examn. of feces are described; and the clinical interpretation of the results is discussed. J. S. H.

Estimation of calcium in blood. S. PERN. *Proc. Roy. Soc. Victoria* 30, 137-8(1918); *Physiol. Abstracts* 3, 427(1918).—The blood (1 cc.) is carefully ashed, AcOH is added, and the soln. is filtered through Ca-free paper; oxalic acid and alc. are added to the filtrate; Ca oxalate is pptd. in an amorphous state and is detd. nephelometrically; the alc. hastens pptn. For clinical work, the blood is mixed with twice its vol. of 6.5% trichloroacetic acid; the mixt. is permitted to stand for 24 hrs.; and Ca is then detd. in the clear supernatant liquid. JOSEPH S. HEPBURN.

Report of the committee on uniformity in the Wassermann reaction. WILLIAM LITTEBER AND CHARLES WATTERSON. *Southern Med. J.* 11, 263-7(1918); *Abstracts*



*Bact.* 2, 180(1918).—Report of the committee of the Southern Med. Assoc. Each committee member examd. 3 sets, each of which consisted of 50 sera. With set 1, each member used his own technic and his own reagents; the results agreed in but 74% of the tests. With set 2, each member used a uniform technic and his own antigen; the results agreed in 86% of the tests. In set 3, each member used a uniform technic and a uniform antigen; practically no disagreement in results was obtained. It is concluded that a uniform technic and a uniform antigen in the hands of men trained in lab. work will give uniform results if adhered to closely in every detail. J. S. H.

**Chloride determinations in the urine of patients with kidney disease, according to Volhard-Arnold.** A. E. ALDER. *Zürich. Z. klin. Med.* 86, 80-8(1918).—Urine was obtained from patients suffering from various kidney diseases: acute hemorrhagic, chronic interstitial, chronic parenchymatous and interstitial arteriosclerotic forms of nephritis, also uro-genital tuberculosis. The values for the NaCl content of the urine were always higher in ashed urine than in urine from which the albumin had previously been removed; this was true if albumin was present in measurable amt. The pptd. albumin usually contained NaCl to an amt. which corresponded to the difference in values obtained by the 2 procedures. It is therefore recommended that, if a urine contain albumin, the urine be ashed, and the NaCl be detd. on the ash by the Volhard-Arnold method, in order to obtain an accurate result. JOSEPH S. HEPBURN.

**Adamkiewicz reaction and the transformation of glyoxylic acid to methanal.** E. VOISENET. *Bull. soc. chim.* 23, 361-9(1918); cf. *C. A.* 12, 1767.—In the A. reaction V. shows that HCHO is produced in two ways, (1) by the oxidation of the AcOH used as a reagent, (2) if any OHCCO<sub>2</sub>H is formed by oxidation of AcOH, it is in turn decompd. into HCHO and CO<sub>2</sub> by the strong acids present. The HCHO produced, rather than OHCCO<sub>2</sub>H, is responsible for the color change in the reaction. Consequently the following procedure is substituted for the glyoxylic acid reaction: To 5 drops of white of egg add 3 cc. pure 1-3 H<sub>2</sub>SO<sub>4</sub>; after soln. of the albumin, add 1 drop of com. HCHO dild. 1-100. Then 1 drop of 1% NaNO<sub>2</sub> or KNO<sub>2</sub> produces a violet color. With 1 cc. milk or a pinch of casein use 3 and 4 cc. H<sub>2</sub>O, resp., then 3 cc. of the H<sub>2</sub>SO<sub>4</sub>, bring to boiling and introduce successively a drop of the HCHO and nitrite. Concd. HCl may be used but without addition of H<sub>2</sub>O. C. H. KIDWELL.

**Studies on the submaxillary gland.** V. An automatically filling and recording spirometer. ROBERT GESELL. *Am. J. Physiol.* 47, 507-11(1919).—This is a modified Krogh spirometer. With each expiration of the animal the expiratory valve is raised so as to make an elec. connection, starting a motor which raises the float until 1000 cc. of air are admitted. The movements of the float are traced on a rotating drum, thus recording irregularities in breathing as well as the respiration vol. J. F. LYMAN.

**The relationship between the oxygen concentration and rate of reduction of methylene blue by milk.** E. HARVEY NEWTON. *J. Gen. Physiology* 1, 415-9(1919).—"The rate of reduction of methylene blue by milk and CH<sub>3</sub>CHO is proportional to the concn. of oxygen in the milk." The following method for the detn. of oxygen is given: The milk-CH<sub>3</sub>CHO-methylene blue mixture is shaken with the gas to be analyzed and the time taken for the disappearance of the blue color detd. A control mixture shaken with air is made under the same conditions. Air contains 21% oxygen and if it takes 60 min. to decolorize with air and 40 min. with the unknown gas, the calculation will be  $\frac{40}{60}$  of 21 = 14% oxygen in the unknown gas. CO<sub>2</sub> in the gas up to 5% does not affect the reducing action of milk. 2% NaF will keep milk for 2 months without affecting its reducing action. It is suggested that a protected platinum soln. might be substituted for milk in these detns. CHAS. H. RICHARDSON.

**Determination of carbon dioxide in carbonates (VAN SLYKE) 7.**

## C. BACTERIOLOGY.

**Resopon, a new antiseptic.** THEODOR ZANGGER. *Cor.-bl. f. Schweiz. Aerzte, Basel* 48, 145-6(1918); *Abstracts of Bacteriology* 2, 146.—The antiseptic action of a new compd. of S and resin is described. The compd. is not particularly bactericidal but depends for its action on its stimulation of phagocytic activity. With *Staphylococcus aureus* in a test in which 9.1% of the leucocytes showed phagocytic activity in saline soln. the percentage figures with dilns. of Resopon were: 1:120, 36.6; 1:600, 42.6; 1:6000, 25.7; 1:60,000, 17.6; and 1:600,000, 12.3. Resopon is non-toxic. The results of its use in wounds, in pyorrhea alveolaris, in diphtheretic angina, in otitis media, and in other conditions are described as favorable. E. J. C.

**Chromogenic yeasts—a new biologic reaction for iron.** M. W. BEIJERINCK. *Arch. néerland. physiol.* 2, 609-15(1918); *Physiol. Abstracts* 3, 482(1918).—*Saccharomyces pulcherrimus* secretes a colorless chromogen which becomes a deep red pigment in the presence of O and an Fe salt. On a liquid medium this yeast produces a generation free from fat; on a solid medium (agar containing malt ext. and Fe citrate) some of its progeny contain fat, others do not; the latter may eventually produce a new strain devoid of fat-producing power, *S. pulcherrimus secundarius*. Both strains produce the red pigment in the presence of Fe. Too great a concn. of this pigment is injurious; and cells with a high pigment content die. JOSEPH S. HEPBURN.

**Osmotic experiments with bacterial spores.** C. EIJKMAN. *Arch. néerland. physiol.* 2, 616-20(1918); *Physiol. Abstracts* 3, 482(1918).—Various compds. were dissolved, in increasing concns., in a slightly alk. bouillon, which was then inoculated with anthrax spores, incubated for 24 hrs., and finally examd. microscopically. The osmotic pressure of each soln. was detd. by means of the f. p. more NaCl, NaNO<sub>3</sub>, levulose, and mixts. of NaCl with asparagine or mannitol, etc., all prevented growth at practically the same osmotic pressure. Other compds., e. g., NH<sub>4</sub>Cl and urea, prevented growth by exerting a direct toxic action. JOSEPH S. HEPBURN.

**Several important edible and poisonous fungi.** R. KOBERT. *Deut. Arch. klin. Med.* 127, 47-75(1918). JULIAN H. LEWIS.

**Egg albumin as a complete food for *Isaria densa*.** MARIN MOLLIARD. *Compt. rend.* 168, 523-4(1919).—Commercial egg albumin was dissolved in H<sub>2</sub>O, coagulated by heat, filtered and washed. Enough mineral matter entered into the compn. of the protein, or was retained by adsorption, to suffice for the development of the fungus. The respiratory quotient of the fungus was detd. in the protein medium, in protein to which salts were added, and in a medium composed of protein, salts and sucrose. The values were, resp., 0.55, 0.63 and 0.82. In the protein medium large amts. of oxalic acid were formed. T. G. PHILLIPS.

**Influence of temperature and hydrogen-ion concentration upon the spore cycle of *Bacillus subtilis*.** ARAO ITANO and JAMES NEILL. *J. Gen. Physiology* 1, 421-8 (1919).—At 5°, no germination took place at  $p_H$  1-13; at 25° and 37° it occurred between  $p_H$  5 and  $p_H$  10, but not outside of these limits. The spore cycle was completed only between  $p_H$  5 and  $p_H$  10. At  $p_H$  10, the vegetative cells multiplied to a very slight extent and soon passed into spores, probably due to the unfavorable reaction of the culture medium. The automatic adjustment of the medium seemed to be an important factor in the completion of the spore cycle. Aside from the theoretical interest, the results have an important bearing on the preservation of food by canning and other methods. CHAS. H. RICHARDSON.

**Notes on the reactions of bacteriologic media.** JOHN F. NORTON. *Univ. Chicago. Am. J. Pub. Health* 9, 190-3(1919).—"Data have been presented on the relation between the titratable acidity, using phenolphthalein as an indicator, and the H-ion concn.

This relation depends entirely upon the ingredients of the medium. Sterilization effects appreciable change in the reaction of neutral and alk. media and but little change in acid media. Barnett and Chapman's titration method, slightly modified and extended, will give good results for routine lab. work. The H-ion concn. of a medium is one of the most important factors in obtaining optimum growths of bacteria. This is illustrated by the growth of pneumococci in broth of higher titratable acidity than theretofore reported, but with proper attention to the actual H-ion concn."

FRED W. TANNER.

The bacterial count in water and sewage (STEIN) 14.

#### D. BOTANY.

CARL L. ALSBERG.

Chlorophyll, carotin and xanthophyll, and the production of sugar from formaldehyde. A. J. EWART. *Proc. Roy. Soc. Victoria* 30, 178-209(1918); *Physiol. Abstracts* 3, 546.—In the assimilation of CO<sub>2</sub> chlorophyll acts as a light energizing enzyme, and takes direct part in the cycle of chem. changes, which probably have carotin, xanthophyll, phytol, and glaucophyllins as intermediate products, and glucose, levulose, formaldehyde and O as end products. A rapid method of polymerizing formaldehyde to sugar is described.

E. J. C.

New crystallizable constituent in the underground organs of *Geranium pratense* L. C. WIMMER. *Ber. deut. bot. Ges.* 35, 591-602(1917); *Physiol. Abstracts* 3, 392.—A yellow cryst. substance—probably of the nature of phenol—is described as occurring in the underground organs of various species of *Geranium*.

E. J. C.

The pigment cell of *Ricinus communis*. O. BAUMGÄRTEL. *Ber. deut. bot. Ges.* 35, 603-11(1917); *Physiol. Abstracts* 3, 392.—The red color of this plant is due to special pigment cells with homogeneous red contents. It is suggested that the red compd. is of the nature of a "tannin."

E. J. C.

The problem of nitrogen fixation by lower fungi. H. FISCHER. *Ber. deut. bot. Ges.* 35, 423-54(1917); *Abstracts of Bacteriology* 2, 269; cf. C. A. 11, 2251.—A study of the fixation of N by various bacteria, and bacteria in symbiosis with *Chlamydomonas*, from soils under water. F. holds that the fixation is due to the synthetic action of an enzyme, and that the energy of fixation of the soils in question is connected with their content of protein compds., the decompn. products of protein seeming to play a part in the production of the N-fixing enzyme.

E. J. C.

Investigation of *Chenopodium quinoa*. R. GONZÁLEZ. La Paz, Bolivia (Author), 1917, 2 ed., 45 pp.; *Expt. Sta. Rec.* 39, 610.—This publication discusses *Chenopodium quinoa* under the following topics: History, botanical characteristics, and uses; qual. and quant. chem. analyses; nutritive and digestive value; and the bitter principle of saponin. The compn. of the seed was as follows: Protein 13.125, starch 52.82, cellulose 12.2, moisture 12.5, and ash 5.44%. The compn. of the ash was silica 1.48, P<sub>2</sub>O<sub>5</sub> 1.05, 3CaO 3.01, Fe oxide 1.87, MgO 11.53, and K 38.86%. The starch was very rapidly digested by saliva. The bitter principle proved to be a saponin which has marked antipyretic properties.

E. J. C.

Recent advances in science—plant physiology. V. H. BLACKMAN. London. *Science Progress* 13, 49-53(1918).—This review discusses the factors, chiefly biochem., which govern growth and reproduction in plants, and the antagonism between these 2 phenomena.

JOSEPH S. HEPBURN.

Anatomic and biologic study of the genus *Sauranea* Willd. with special reference to American species. L. BUSCALIONI AND G. MUSCATELLO. *Malpighia* 28, 49-81,

140-62, 239-70(1917); *Physiol. Abstracts* 3, 458(1918).—The work on the degree of development of starch and tannin in the various species is of chem. interest.

JOSEPH S. HEPBURN.

**Effects of illuminating gas and its constituents in causing abscission of flowers in *Nicotiana* and *Citrus*.** T. H. GOODSPEED, J. M. MCGEE AND R. W. HODGSON. *Univ. California Publ. Botany* 5, 439-50(1918).—Presence of illuminating gas in the atm. surrounding flowering laterals of *Nicotiana tabacum* var. *macrophylla purpurea* caused the first flowers to fall in approx. one-half the normal time; the reaction time was approx. the same in all concns. of illuminating gas; the constituents of the latter, which produced premature abscission, were CO, CO<sub>2</sub>, and C<sub>2</sub>H<sub>4</sub>. These expts. were usually conducted in a moist atm. In a dry atm. containing 10% by vol. of illuminating gas, the first flower fell after approx. the same length of time in both the expt. proper and the control (without illuminating gas). In an atm. containing 5% by vol. of C<sub>2</sub>H<sub>4</sub>, the first flower fell almost as soon in the absence as in the presence of moisture, and considerably earlier than in the control without C<sub>2</sub>H<sub>4</sub>. Of the *Citrus* varieties studied, *C. sinensis* var. Washington navel showed a marked abscissional response to illuminating gas, irrespective of the concn. of the latter. *C. sinensis* var. Valencia and *C. limonia* var. Eureka showed little or no increase in the reaction time of the abscission process as a result of exposure to illuminating gas. The illuminating gas used had the following % compn. by vol.: N 4.10, O 0.10, H 55.00, CH<sub>4</sub> 26.30, C<sub>2</sub>H<sub>4</sub> 5.00, CO<sub>2</sub> 1.80, CO 7.70.

JOSEPH S. HEPBURN.

**Hydrocyanic acid in plants. III. Some new cyanogenetic plants.** J. M. PETRIE. *Proc. Linn. Soc. N. S. Wales* 42, 113-7(1917); *Expt. Sta. Rec.* 39, 332; cf. *C. A.* 9, 475.—Newly found cyanogenetic plants (*Expt. Sta. Rec.* 31, 520) as here listed include 5 native and 7 introduced species, some of which are discussed with regard to the distribution of HCN in the plant body.

E. H.

**Chemical and physical changes in apples during the ripening and storage period.** W. P. SNYDER. *Trans. Ind. Hort. Soc.* 1916, 408-11; *Expt. Sta. Rec.* 39, 121.—The apple fruit, considered as a living organism, has first a period of growth during which the dry matter, principally starch, is continually increased. A second, or ripening, period follows, during which starch is changed into sucrose. This in turn is gradually changed into invert sugar, with a gradual decrease of malic acid and of carbohydrates and in accompanying respiration of CO<sub>2</sub>. These changes are largely due to the activity of oxidizing enzymes, the O of the air being drawn upon in the process. The changes progress much more rapidly after picking, at high temps., and in the short-season varieties. Soon after picking, apples should be placed in cool storage to retard the processes above mentioned. Respiration continues during the storage period, becoming ultimately less active. Transpiration continues during the life of the apple. The third period is that of disintegration.

E. H.

**The chemical investigation of some poisonous plants in the natural order Solanaceae. IV, V.** J. M. PETRIE. *Proc. Linn. Soc. N. S. Wales* 42, 118-35, 137-45 (1917); *Expt. Sta. Rec.* 39, 433; cf. *C. A.* 12, 2345.—The first of these articles gives an account of a study of *Duboisia myoporoides* and *D. hopwoodii* (the 2 species of this genus which are best known) as regards some of their chem. components with their physiol. effects, also the total alkaloids in each plant. The results are presented in tabular form. In the second article (cf. *C. A.* 12, 1889) are presented some special studies on *D. leichhardtii*, said to be endemic in eastern Australia, though not so well known as the 2 species described above. The leaves of this species contain a mixt. of the mydriatic alkaloids, amtg. to 1.4% of the plant material dried at 100° or 0.28% of the fresh plant. *D. leichhardtii* closely resembles *D. myoporoides* as regards its alkaloids; both of these

species in this respect contrast markedly with *D. hopwoodii*, the pituri plant, which contains nicotine. E. H.

The influence of light on the absorption of organic substances from the soil by plants. DOLORES CEBRIAN DE BESTEIRO AND MICHEL-DURAND. *Compt. rend.* 168, 467-70(1919).—The object of the work was to det. whether a plant exposed to such a low light intensity that it is unable to assimilate enough C by photosynthesis to support normal growth is able to compensate for this lack by taking up org. compds. through the roots. *Pisum sativum*, a plant that grows best in strong light, was used. The plants were grown in Knop's soln. to which 4 parts per 1000 of glucose had been added. The roots grew aseptically in this culture medium. Sunlight, and light equal to  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$ , the intensity of sunlight were used. In sunlight growth was more rapid than in less intense light, and more glucose was removed from the soln. The amt. of glucose removed per g. dry wt. of plant was practically const. in all the light intensities used. It is concluded that this plant is unable to make up for low photosynthetic assimilation by the absorption of org. compds. through the roots. The work is to be continued with plants that grow best under reduced illumination. T. G. PHILLIPS.

Spectrographic studies of the ash of marine plants. EUGENE CORNRC. *Compt. rend.* 168, 513-4(1919).—The complete study of the spectrograms was limited to the ultraviolet region between 2500 and 3500 Å. This serves to detect most of the heavy metals, particularly the rare metals. The following elements were found: Ag, As, Co, Cu, Mn, Ni, Pb, Zn, Bi, Sn, Ga, Mo, Au, Sb, Ge, Gl, Ti, W, V. Au, Bi, Ga, and Ge were present in the most minute traces. The species of plant used is not mentioned. T. G. PHILLIPS.

Comparative studies on respiration. VI. Increased production of carbon dioxide accompanied by decrease of acidity. MARIAN IRWIN. *J. Gen. Physiology* 1, 399-403 (1919); cf. *C. A.* 13, 241.—A high concn. of  $\text{Et}_2\text{O}$  caused an increase in oxygen consumption and in the production of  $\text{CO}_2$  in the petals of *Salvia* and at the same time caused a decrease in the acidity of the cell contents. CHAS. H. RICHARDSON.

Factors involved in the ripening of fruits. R. E. NEIDIG, C. W. COLVER, H. P. FISHBURN AND C. L. VON ENDE. *Idaho Agr. Expt. Station Report* 1917, 22-5.—A study was made of the relationships between the phys. and chem. changes involved in the ripening of different varieties of apples. The phys. consts. detd. were osmotic pressure, refractive index and elec. conductance. To follow the chem. changes, detns. were made of starch, total sugars, invert sugar, total solids and acidity. A close relationship was observed between the curves for the phys. consts. and those for sugar and total solids. The refractive index is considered a very important phys. const. for actually measuring the carbohydrate change. The elec. conductance is approx. proportional to the K content of the cell and is affected by desiccation and respiration. The carbohydrate changes which take place in the apple during growth consist of a rapid increase of invert sugar, and a rapid increase of starch which begins to diminish about Sept. 1; during ripening the decrease in starch corresponds to the rapid increase in sucrose, the content of which is low until starch begins to disappear, when it increases rapidly; after ripening and storage there is a slight increase in invert sugar followed by a continual decrease, and sucrose also gradually decreases. Analyses of green apples indicate that the hexoses are the base sugars from which the reserve material, starch and sucrose are formed. In a preliminary study on the action of sp. enzymes in the cell it was found that with one exception oxidase occurs in very green apples of all the varieties examd. Esterase was also present, but no conclusive evidence was found that indicated the presence of the enzymes diastase or invertase. W. H. R.

The chemistry of sea-weeds. JAMES HENDRICK. *Nature* 102, 494-5(1919).—While not agreeing entirely with the criticism offered by Sauvageau (*C. A.* 13, 234) on the work that has hitherto been done on the chemistry of sea-weeds, it is nevertheless admitted that much valuable work still remains to be done in this field by chemists with a competent knowledge of the botany of sea-weeds, or working in collaboration with botanists who would collect and identify the samples for analysis. W. H. R.

The water hyacinth as a source of potash (DAY) 18.

## E. NUTRITION.

PHILIP B. HAWK.

### NORMAL.

Accessory foodstuffs. H. ARON. *Berlin klin. Woch.* 55, 546-50(1918); *Physiol. Abstracts* 3, 563.—General on "vitamines." E. J. C.

Vitamines. R. KLEISSEL. *Wien. med. Woch.* 68, 601-5, 646-51(1918); *Physiol. Abstracts* 3, 563.—A general discussion of the effect of the food accessory factors on metabolism. E. J. C.

The vitamins. E. MADSEN. *Ugeskrift for Læger* 80, 613(1918); *Physiol. Abstracts* 3, 381.—Lactating women must have food rich in "vitamines." Desiccation destroys "vitamine" in fruit, vegetables, etc. M. thinks there is much to suggest that a lack of "vitamines" is a factor in chlorosis, anemia, neurasthenia, and vasomotor disturbances. War edema may be a rudimentary form of beriberi. E. J. C.

The feeding of troops. Extract from the proceedings of the permanent delegation of the sanitary commission of the allied countries, session of Nov. 8, 1917. *Arch. farm. sper.* 25, 17-56(1918).—The ration of the Italian army was changed during the war by reduction in the amount of meat and bread, and this partly compensated by addition of cheese and fresh or canned vegetables. The old garrison ration contained 146 g. protein, 31 g. fat and 517 g. carbohydrate, and supplied 3013 calories. The new ration contains 127 g. protein, 38 g. fat and 469 g. carbohydrate, and supplies 2795 calories. Bread was reduced from 750 to 600 g. per day, and meat from 1200 to 600 g. per week. The remainder of the weekly ration consists of dough 800 g., rice 410 g., beans, lentils or peas 230 g., cheese 180 g., potatoes 420 g., vegetables 750 g., and condiments. The old field ration contained 222.4 g. protein, 45 g. fat, 669 g. carbohydrate, and supplied 4082 g. cal. The new ration contains 165 g. protein, 42 g. fat, 469 g. carbohydrate, and supplies 3006 calories. The daily bread component was reduced from 750 to 700 g., and the meat from 375 to 250 g. The remainder of the weekly ration consists of dough 600 g., rice 450 g., cheese 350 g., potatoes 450 g., condiments 182 g., beans 160 g., vegetables 400 g. and wine 750 cc. Canned meat, codfish or salmon may be substituted for fresh meat. The daily allowance of coffee is 15 g. and sugar 20 g. For troops fighting in the trenches a dose of alcohol is added; with the wine distributed three times a week each soldier receives 150 cc. marsala or 40 cc. elixir of quinine. The quantity of bread may be increased 50%. The allowance of sugar and coffee, in winter or in the mountains, is frequently doubled. Finally, the potato and vegetable components are increased to 150 g. potatoes, 200 g. vegetables and 80 g. beans daily. The ration of troops in the first line is considerably increased (3200 to 3250 cal.) according to station and altitude. In the Italian navy, the ration supplies 2977 cal. for men on shore and 3036 for those on shipboard; on shore 250 g. meat, 250 g. bread; on shipboard 275 g. meat (except Friday), 570 g. bread, per day. The remainder of the ration consists of dough 640 g., rice 420 g., beans 340 g., cheese 50 g., tunny fish 50 g. on Friday, and oil 142 g. per week, besides coffee, sugar, salt and vinegar. In addition, each man is allowed daily 10 centesimi on shore and 12 centesimi on shipboard for the purchase

of vegetables. To men on board 250 cc. wine per day is issued, and to those on shore 250 cc. per week. Fishing is encouraged during leisure hours to supplement the ration.

A. W. DOX.

**Use of vegetable milk in children.** HENRY D. CHAPIN. *Arch. Pediatrics* 36, 28-31(1919); cf. *C. A.* 12, 1793.—A description of the prepn., compn., properties, and use of almond milk.

JOSEPH S. HEPBURN.

**Report of the Cornell nutrition class.** MAY G. WILSON. Cornell Univ. Med. College. *Arch. Pediatrics* 36, 37-44(1919).—Of interest to the student of nutrition.

JOSEPH S. HEPBURN.

**Study of the metabolism of the Japanese laboring classes.** B. KOMU AND T. SOKAMOTO. *Jusenkaï Zasshi* 22, No. 10, 50-2(1917); *Jap. Med. Literature* 4, 7-8 (1919).—Two laborers of av. strength worked for from 13 to 14 hours daily. The av. daily food consumption by one laborer was 3786 cal. of which protein supplied 333 cal., fat 169 cal., carbohydrate 3148 cal. and alc. 136 cal.; by the other laborer 3746 cal., of which protein supplied 375 cal., fat 182 cal., carbohydrate 3125 cal., and alc. 64 cal. A laborer was unable to work on a diet of salted radish and rice; the intake of N was 9.77 g., the output 12.3 g.; addition of hashed fish to the ration rapidly restored the N equil., and made possible resumption of work.

JOSEPH S. HEPBURN.

**Influence of light on the formation of creatinine.** C. J. C. HOOGENHUIJZE AND J. W. BEST. *Arch. néerland. physiol.* 2, 685-8(1918); *Physiol. Abstracts* 3, 452(1918).—The influence of light on endogenous metabolism was studied by detn. of the creatine and creatinine content of the urine. A creatine- and creatinine-free diet was taken for 2 days, and the amt. of these compds. present in the urine was then detd. for 3 days in order to obtain a normal av. The following day 1 of the investigators sat for 20 min. in a box lined with incandescent lamps, and having a temp. of 40 to 45° when closed and 35 to 36° when ventilated. In a series of 4 expts., exposure to light and heat or to light alone always produced a considerable increase in the creatinine; creatine was always absent; a negligible effect was produced by exposure to heat alone. A similar increase in creatinine occurred in 2 patients after a sun bath, and in several other patients after partial exposure of the body to X-rays.

JOSEPH S. HEPBURN.

**Researches on uric acid metabolism in man.** F. GUDZENT, C. MAASE AND H. ZONDEK. *Z. klin. Med.* 86, 34-63(1918).—Uric acid should be detd. in both blood and urine, in studies of purine metabolism. Administration of nucleic acid to healthy persons and to leukemia patients produced a parallelism between the uric acid of the blood and of the urine. Exts. of glandular organs (thyroid, pancreas, spleen, adrenals) produced a somewhat transient, but considerable, increase in the uric acid content of both the blood and the urine. The gout remedies—colchicum, atophan, and thorium X (used as a radio-active substance)—gave rise to a temporary increase in the uric acid content of both fluids; purgatives produced a similar result. Astringents exerted no action on the purine metabolism. Ca, and possibly I, increased the uric acid content of the urine and decreased that of the blood, evidently by action on the kidney.

JOSEPH S. HEPBURN.

**Question of the digestibility of heated and unheated casein.** O. HAMMARSTEN. *Arch. néerland. physiol.* 2, 658-63(1918); *Physiol. Abstracts* 3, 441-2(1918).—A 3 to 4% soln. of tetra- or penta-alkali caseinate was prepd. and a portion of the soln. was heated in an autoclave for 1 hr. at a temp. of 115 to 125°. The casein was then converted into acid caseinate and digested with com. rennet for 17 min. at 38° in the absence of free HCl; the denatured (heated) casein yielded more proteose than did the unheated casein. Heated caseinate solns. contained a certain amt. of proteose and a readily

digested casein-like substance, which was pptd. by acid; in 1 expt. 70% of this mother substance was digested to proteose by rennet in less than 10 min. at body temp.

JOSEPH S. HEPBURN.

**Diet, nutrition, and excretion of Asiatic races in Singapore.** II. J. A. CAMPBELL. *J. Straits Branch R. A. Soc.* 79, 107-12(1918); *Physiol. Abstracts* 3, 565; cf. *J. Straits Branch R. A. Soc.* 76, 57-65(1917).—The present paper relates to laborers (Chinese bakers, jinriksha runners, rubber coolies, Tamil gardeners, etc.). The observations are not very numerous, but the figures show that the urine differs materially from that in European laborers. The total N varied from 7.2 to 11.4 g. *per diem*; details of its partition are given, and the high proportion of  $\text{NH}_3$  is specially noted; uric acid, Cl, and  $\text{P}_2\text{O}_5$  are low. The diet so far as fat and protein are concerned is low. The total calories are small. The hot moist climate is a factor; so also is the small amt. of work the laborers perform. As McCay has already pointed out, their general physique is inferior to that of Europeans.

E. H.

**Bakers' yeast as food for man.** P. B. HAWK, C. A. SMITH AND R. D. HOLDER. *Am. J. Physiol.* 48, 199-210(1919).—Bakers' yeast can replace from 9 to 29% of the protein in the diet of man without detriment to the best nutritive interests of the individual. Utilization of the food, retention of protein, maintenance of body wt. and general conditions of health are regarded as favorable to the yeast food. When as much as 4 g. yeast N is consumed per day a laxative effect is usually noticed.

J. F. LYMAN.

**Compressed yeast as food for the growing organism.** P. B. HAWK, H. R. FISHBACK AND OLAF BERGEM. *Am. J. Physiol.* 48, 211-20(1919).—Diets consisting of casein 20%, starch 63%, butter fat 15% and salt mixture 2%, or of dried meat 20%, starch 63%, butter fat 15% and salt mixture 2% will not support growth in young, white rats. The addition of 5% dry yeast to the above diets, deficient in water-soluble vitamin, gives rapid growth in both cases. Heating the yeast to 105° did not destroy its growth-promoting properties.

J. F. LYMAN.

**Influence of the principal constituents of sweetened condensed milk on the nutritive and therapeutic effects of the latter.** P. LASSABLIÈRE. *Compt. rend. soc. biol.* 81, 764-7(1918).—Sweetened condensed milk (a), unsweetened condensed milk (b) and unsweetened condensed milk with 10% of added sucrose (c) were fed (650 cal. per 24 hrs. ration in all cases) for 1 mo. to 5 mos. old infants; the increase in wt. observed was in the increasing order (b), (c), (a). Addition of sucrose to (c) had a favorable influence on increase in wt. but did not render (c) equal in value to (a) in this respect. In order to det. the influence of varying concns. of sucrose 4, 5 and 8 mos. old infants were given a diet of sweetened condensed milk dild. with  $\text{H}_2\text{O}$  so as to contain 6, 8 and 10% of sucrose, milk of each concn. being fed to infants of each of the ages above mentioned; the caloric values of the 24-hr. rations were 600, 650 and 750 cal. for 4, 5 and 8 mos. old infants, resp. The greatest increase in wt. was observed with the normal dild. corresponding to 8% of sucrose; less favorable results were obtained with the 10% than with the 6% concn. This result explains to a certain extent the various opinions which have been held with respect to the use of sweetened condensed milk. Study of the influence of sweetened condensed milk, sterilized milk and milk powder in gastro-intestinal disorders showed that the 1st named was distinctly superior to the others in its therapeutic effect; this was detd. by noting the no. of days of each diet which were required to arrest diarrhea and vomiting. A similar comparative study of the influence in gastro-intestinal disorders of (1) sweetened condensed milk dild. to 10% sucrose content, (2) unsweetened condensed milk and (3) unsweetened condensed milk with 10% added sucrose (rations of same caloric value in each case) showed that the favor-



able effect produced was in the increasing order (2), (3), (1). Sucrose has, therefore, a positive and favorable effect but this is not sufficient to explain the order of results obtained with sweetened condensed milk.

H. S. PAINE.

#### ABNORMAL.

**Experimental mammalian polyneuritis produced by a deficient diet.** C. VOEGTLIN AND G. C. LAKE. *Am. J. Physiol.* 47, 558-89(1919).—See C. A. 12, 2355.

J. F. LYMAN.

The deficiency theory of the origin of beri-beri in the light of clinical and experimental observations on the disease, with an account of a series of forty cases. F. M. R. WALSH. *Quart. J. Med.* 11, 320-38(1918).—A consideration of the deficiency theory of the origin of beri-beri in the light of recent clin. and exptl. work makes it clear that the present hypothesis, which postulates a single neg. factor, the absence of a sp. accessory food factor or vitamine, is inadequate. It conflicts with the results obtained in starvation expts. on fowls. Starved fowls live sufficiently long to develop the disease under such conditions, yet they die without developing it, although in this essential respect, namely, the deprivation of vitamins, starvation is the equiv. of an avitaminic diet. The use of certain special diet is found to be an essential condition of the production of the disease both in man and poultry. It is apparent that there are two factors in the production of beri-beri, the absence of an accessory food factor or vitamine and the use of certain foods which are the direct and immediate cause of the disease. There is a considerable wt. of evidence to prove that carbohydrates constitute this second direct and immediate factor. It seems probable that in the absence of their sp. vitamine they undergo an aberrant hydrolysis with the production of toxic by- and end-products, thus producing beri-beri. Viewed in this light the disease is an intoxication. The facts regarded as excluding a toxic origin of beri-beri do not exclude an intoxication in this sense. From another point of view, it may be questioned whether the clin. and pathol. characters of the disease are compatible with the theory that it is a slowly progressive diffuse degeneration of the nervous system. A consideration of the phys. and chem. properties of vitamins, as far as they are known, suggests the probability of their belonging to the class of bodies known as enzymes, and of their being thus concerned in the hydrolysis of carbohydrates. It seems certain that until the phys. chemistry of the vitamins and the metabolism in beri-beri have been more fully investigated, the pathogenesis of beri-beri will remain in part obscure. The article has a bibliography of 26 titles.

JOHN T. MYERS.

**Excretion of xantho-uric compounds from the standpoint of the pathogeny of gout.** J. CHAUSSIN. *Compt. rend. soc. biol.* 81, 234-7(1918).—C. studied the variations in concn. of uric acid and xanthic compds. (detd. *en bloc* by the Haycraft-Denigès method and designated as "xantho-uric" compds.) in the urine of a no. of subjects during the course of a 24 hr. period (8-10 successive samples in 24 hrs.). Three characteristic types of excretion were encountered. In the 1st type (regarded as normal) chlorides and urea were excreted at concns. varying 4-fold or more; the max. concns. were 23 g. and 52 g. per l. for chlorides and urea, resp. The xantho-uric compds. were excreted at concns. varying from 0.59 g. to 1.68 g. per l. In the 2nd type the concns. of chlorides and urea did not vary greatly during successive intervals and attained maxima of only 13 g. per l. for chlorides and 20 g. per l. for urea. The concn. of xantho-uric compds. varied from 0.65 to 1.50 g. per l. This type shows that normal xantho-uric excretion may be associated with diminished chloride and urea elimination. In the 3rd type (gout) the xantho-uric concn. was remarkably uniform and only varied from 0.33 g. to 0.48 g. per l.; 0.50 g. per l. may be regarded as the max. limit. Urea and chlorides were not detd., although with an ordinary diet they appear to be eliminated in practically normal amt. with considerable differences in concn. at successive intervals. H. S. PAINE.

**Relative to appearance of antiscorbutic substances during germination of cereals.** E. WEILL, G. MOURIQUAND AND Mlle. PÉRONNET. *Compt. rend. soc. biol.* 81, 678-9 (1918).—Replying to comments by Netter relative to their investigation of this subject (cf. *C. A.* 13, 749) the authors state that the precautions emphasized by Chick and Hume were observed and claim that the results obtained cannot be attributed to simple inanition. H. S. PAINE.

**Significance of "carence" in the interpretation of the results of investigations of artificial alimentation and aseptic life.** E. WEILL AND G. MOURIQUAND. *Compt. rend. soc. biol.* 81, 1253-4 (1918).—The significance of "carence" has been overlooked to a great extent in investigations on artificial alimentation of the higher animals and the interpretation of these results has been subject to error. The results of Forster's expts. (feeding of demineralized meat to dogs in order to prove the necessity for inorganic constituents in the diet) are due in considerable measure at least to the absence of vitamines. The same objection may be made to the expts. of Lunin, Sonin, Knapp, Jacob, Rohmann, Falta and Noeggerath. Absence of vitamines also doubtless played a considerable role in the results obtained by Nuttal and Thierfelder, Charrin and Guillemonat, Schottelius, Kuster and Cohendy in expts. in which sterilized rations were fed to chickens, guinea pigs and kids. The results obtained led some of these investigators to believe that life cannot be sustained in the absence of bacteria. In order properly to det. this question the rations should be aseptic but not sterilized by heating or at least it is necessary that the ration should contain a certain proportion of "fresh," aseptic food. Although vitamines are not so indispensable to lower organisms it is probable that the more favorable results sometimes obtained with bacterial cultures in media which have not been sterilized by heating are due to the presence of vitamines; this idea is in accord with the improved results obtained by Noguchi with spirochete cultures when a fragment of fresh kidney was introduced into the medium. The role of vitamines should never be disregarded in studies on nutrition. H. S. PAINE.

#### F. PHYSIOLOGY.

ANDREW HUNTER.

**Amylolytic action of urine.** W. R. FEARON. *Dublin J. Med. Sci.* No. 562, 149-83 (1918); *Physiol. Abstracts* 3, 569.—The methods adopted were to det. the achromic point and the amt. of reducing substances formed, in preference to Wohlgemuth's. The amylase present was not identified; its amt. varies in health, and is reduced in nephritis and to a less extent in diabetes. E. J. C.

**The composition of the blood of aviators.** A. GEMELLI. *Arch. ital. biol.* 1917, published 1918, 67, 197-205; *Physiol. Abstracts* 3, 512.—The view is advanced that cold is the main cause of the increase of red corpuscles found in the blood of airmen. E. J. C.

**Physiological action of urea.** S. BAGLIONI. *Arch. ital. biol.* 67, 49-68 (1917); *Physiol. Abstracts* 3, 500.—The old observation that the blood and tissues of selachian fishes are rich in urea is confirmed, and the view is advanced that in these animals it plays a useful role. It is regarded as necessary for the maintenance of heart rhythm as NaCl. In perfusion expts. it elevates the cardiac tonus, and therefore opposes NaCl. Perhaps it is essential for the maintenance of function in other organs also. The kidneys of these fishes only remove from the blood a small percentage of its urea, the blood remaining relatively rich in that substance. Details are added of the compn. of the body fluids and urine of various worms, molluscs, and arthropods, and among the statements is one that the normal urine of the octopus contains albumin. E. J. C.

**Contribution to the study of human enamel, with special reference to its nutrition.** JOHN S. MARSHALL. *Univ. Calif. Dental Items of Interest* 41, 216-29 (1919).—Sec-

tions—usually 10 to 12 micra thick—were prepd. from fresh teeth by grinding. Staining was best done in vacuum prior to grinding. Blue dyes (gentian violet, aniline blue, methylene blue) were most satisfactory; next came  $\text{AgNO}_3$ ; red dyes (eosin, safranin) were far from satisfactory. By this technic, the enamel was shown to contain very numerous cul-de-sacs, which are connected with the dentinal tubuli, and possibly supply nutrition to the enamel.

JOSEPH S. HEPPBURN.

**Contributions to the physiology of the glands. I. ASHER. XXXV.** The dependence of the inner secretion of the pancreas on the nervous system. J. M. DE CORRAL. *Z. Biol.* 68, 395-418(1918); *Physiol. Abstracts* 3, 456(1918).—The exptl. animals were 8 dogs, which were kept under anesthesia by ether plus morphine or urethan; the nerve supply of the liver was destroyed with pure  $\text{PhOH}$  in the periportal region; the influence on the pancreatic hormone of vagus stimulation, produced by induction shocks (1 min. stimulation and 1 min. rest alternately for 10 or more min.) was then detd. Vagus stimulation decreased the blood sugar (quant. detn. by Bang's micro-method) whether the content prior to stimulation was normal or abnormally high as a result of hyperglycemia of anesthesia. The rapidity of this change indicated an increase in sugar cleavage as the main action of the pancreatic hormone. Introduction of a resting period sometimes produced an increase in blood sugar. The same procedure minus vagus stimulation caused an increase in blood sugar. The results indicate the existence of stimulating fibers in the vagus for the internal secretion of the pancreas.

JOSEPH S. HEPPBURN.

**"Staircase" in the curve of muscular work. I. GUNZBERG. Arch. néerland. physiol.** 2, 664-8(1918); *Physiol. Abstracts* 3, 415(1918).—In a study of this phenomenon, the gastrocnemius of the frog was perfused with Ringer soln. minus K for 6 to 24 hrs., and the sciatic nerve was stimulated by induction shocks every 2 sec. When a continuous current of O was bubbled through the perfusing liquid, a very prolonged staircase effect was produced, probably as the result of metabolic processes necessary for production of a sufficient concn. of lactic acid, formation of which is retarded by O. These results were proved and verified by the action of  $\text{CO}_2$  which produced a more rapid ascent of the staircase.

JOSEPH S. HEPPBURN.

**Hydrolysis of whale muscle protein. Y. OKUDA AND T. OKIMOTO. Tokyo Kwagaku Kwai Shi. (J. Tokyo Chem. Soc.)** 40, 60-7(1919).—Whale muscle was extd. with  $\text{H}_2\text{O}$ , alc. and  $\text{Et}_2\text{O}$ , from which protein was isolated as usual. The material for the hydrolysis thus obtained contains 4.23%  $\text{H}_2\text{O}$ , 15.96% N and 0.29% ash. The distribution of N in the dry ash-free substance is as follows: 15.99% N sol. in  $\text{H}_2\text{SO}_4$  (0.51% humin N, 0.51% amino N, 5.18% basic org. N; 9.39% mono-amino acid N), 0.72% N insol. in  $\text{H}_2\text{SO}_4$ . Hydrolyzing the protein, 4.66% alanine, 6.25% valine, 3.54% leucine, 1.51% probine, 2.59% phenylalanine, 1.47% aspartic acid, 3.28% glutamic acid, 0.49% serine, 2.40% tyrosine, 6.48% arginine, 3.44% histidine, 9.48% lysine, 0.91%  $\text{NH}_3$  + tryptophan were isolated.

S. KOMATSU.

**Hydrolysis of cod muscle protein. Y. OKUDA AND T. YADA. Tokyo Kwagaku Kwai Shi (J. Tokyo Chem. Soc.)** 40, 67-75(1919).—The protein for hydrolysis was prepd. from cod muscle by the usual method. It contained 13.74%  $\text{H}_2\text{O}$ , 14.80% N and 0.61% ash. The dry ash-free protein contained 17.02% N sol. in  $\text{H}_2\text{SO}_4$  and 0.25% N insol. in  $\text{H}_2\text{SO}_4$ . On hydrolysis, O. and Y. obtained the following results: 3.53% alanine, 3.88% valine, 2.46% leucine, 1.68% probine, 2.31% phenylalanine, 0.61% aspartic acid, 5.24% glutamic acid, 0.51% serine, 2.46% tyrosine, 6.68% arginine, 2.29% histidine, 8.35% lysine, 0.75%  $\text{NH}_3$  and tryptophan.

S. KOMATSU.

**Effect of osmotic pressure on the excitability of the nerve. R. SHOJI. Am. J. Physiol.** 47, 512-33(1919).—When nerves are immersed in solns. of varying osmotic

pressures their elec. resistance is so changed that excitability cannot be estimated by measuring the threshold strength of elec. stimulus. Rather excitability should be detd. by the propagation velocity of excitation through the affected part of the nerve. The optimum osmotic pressure for excitability of the nerve is  $\Delta = -0.4^\circ$ , which is that of a 0.7% NaCl soln. A higher or a lower osmotic pressure than this decreases the excitability of the nerve.

J. F. LYMAN.

The stimulation and inhibition of the gastric secretion which follows the subcutaneous administration of certain organ extracts. JOHN ROGERS, JESSIE M. RAHE AND ELEEZA ABLAHADIAN. *Am. J. Physiol.* 48, 79-92(1919).—Subcutaneous injection of various glandular exts. affected gastric secretion in dogs having Janeway fistulas through which the gastric juice could be withdrawn by catheter. Alk. saline exts. or alc. exts. of thyroid glands contain non-coagulable substances which are vigorous stimulants for gastric secretion, acting probably on the terminal filaments of the vagus. Exts. from adenomatous or hyperthyroid human glands are inert. Exts. of the adrenal glands vigorously inhibit gastric secretion, the adrenal nucleoproteins being more active than the non-coagulable portion. Pituitary exts. inhibit gastric secretion but only about one-half as vigorously as do exts. of adrenals.

J. F. LYMAN.

The mechanism of ether hyperglucemia. R. W. KEETON AND E. L. ROSS. *Am. J. Physiol.* 48, 146-60(1919).—Hyperglucemia, induced in dogs by ether anesthesia, is persistent but if the splanchnic nerves are severed it is only transient. When the liver is denervated but the nerves to the adrenals left intact ether anesthesia causes persistent hyperglucemia of a lower grade than in the normal animal. The mechanism of glucemia by ether and that by elec. stimulation of the splanchnic nerve are believed to be identical.

J. F. LYMAN.

The influence of internal secretions on the formation of bile. A. W. DOWNS AND N. B. EDDY. *Am. J. Physiol.* 48, 192-8(1919).—The amt. of bile secreted is (1) increased by secretin, (2) decreased by adrenaline, and by mammary, testicular ovarian, pancreatic and thymus glands, (3) not affected in a definite way by spleen and thyroid.

J. F. LYMAN.

Alterations in the activity of the terrapin's heart relative to slight changes in the  $P_H$  value of the perfusate. E. C. ANDRUS. *Am. J. Physiol.* 48, 221-30(1919).—Normal terrapin blood has a  $P_H$  value of 7.4 to 7.5. Variations of acidity in the Ringer soln. perfusing the isolated heart, within physiol. limits, markedly affect the tonus and amplitude of the heart muscle. A decrease in acidity to a  $P_H$  value of 7.6 to 7.8 causes a rapid increase in tonus, especially in the auricles, and a decreased amplitude. A rise of the  $P_H$  value to 7.3 increases the cardiac output in either or both of 2 ways, i. e., by a decrease in tone and hence an increase in initial vol. or by an increase in the amplitude of beat.

J. F. LYMAN.

The respiration and oxyhemoglobin dissociation curves and buffer value of the blood in normal men. L. S. DEBENHAM AND E. P. POULTON. *Quart. J. Med.* 12, 38-60(1919).—The object of this paper is to consider what exptl. methods are suitable for investigating the respiration in pathol. conditions, and to bring forward certain measurements on normal men to serve as a standard with which to compare similar measurements in pathol. conditions. The pulmonary ventilation, alveolar  $CO_2$ , alveolar ventilation, tidal air, dead space, and respiratory exchange have been measured in ten normal men at rest in bed. The methods described by Haldane and Priestley, and by Hasselbalch and Lindhard, for measuring the alveolar  $CO_2$  were compared, and show satisfactory agreement. Values for K (the const. of the oxyhemoglobin dissociation curve at the alveolar  $CO_2$  pressure, were detd. in eleven normal men, and agree with values previously published. It is not by any means certain that the blood has a lower

buffer value in cases of irritable heart. The buffer value of the blood was studied in three cases of acidosis and as measured by the  $\text{CO}_2$  was much the same in the three cases. Twenty-four references are appended.

JOHN T. MYERS.

**Relation between thyroid gland, metamorphosis, and growth.** EDWARD UHLENHUTH. *J. Gen. Physiology* 1, 473-82(1919).—Two substances are involved in the metamorphosis of the amphibian, *Ambystoma opacum*, namely iodine taken up by the food and an excretor substance evolved during growth which induces the excretory function of the thyroid gland. Larvae in which the metamorphosis is inhibited by the lack of iodine have their growth checked because the excretor substance brings about the excretion of toxic substances from the thyroid gland. These toxic substances break down the proteins and thus decrease the size of the larvae. When the thyroid gland is removed or in species which have an hereditary lack of it, the animal grows normally, since the thyroid is not present to excrete the toxic growth-inhibiting substances. At low temp. less excretor substance is produced and consequently larvae kept at a low temp. reach a larger size than those kept at a high temp. (cf. C. A. 13, 864, 878).

CHAS. H. RICHARDSON.

### G. PATHOLOGY.

H. GIDEON WELLS AND ANDREW HUNTER.

**Enzyme studies in carcinoma.** B. BRAEN. *Z. Krebsforsch.* 16, 112(1917); *Abstracts of Bacteriology* 2, 154.—A study of the catalase, lipase, and lecithinase content of the autolyzed livers of healthy and carcinomatous individuals. Autolyzed carcinoma and sarcoma have a very low enzyme content in comparison with normal liver.

E. J. C.

**The chemico-biological processes in cancer.** F. BLUMENTHAL. *Z. Krebsforsch.* 16, 58(1917); *Abstracts of Bacteriology* 2, 154.—A review of the results of enzyme investigations on malignant tumors.

E. J. C.

**An application of Vernes' method. Influence of the aging of the serum on the sero-diagnosis of syphilis.** ROGER DOURIS. Nancy. *Bull. sci. pharmacol.* 26, 49-53(1919).—Using the method of Vernes, D. found that normal serum collected aseptically and kept on ice, when tested from week to week, showed a regular transition in characteristics to that of syphilitic serum, *e. g.*, lowered hemolytic power. Serum from syphilitics loses what hemolytic power it has more quickly than does normal serum. The reaction is more rapid when samples are kept at ordinary temp. NaF 1-2 mg. per cc. retards the reaction. *Treponema pallidum* produces in the serum of syphilitics modifications analogous to those which time produces in normal serum. The age of the serum is therefore a factor concerning which account must be taken among the conditions regulating the sero-diagnosis of syphilis. Cf. C. A. 12, 915, 2009; 13, 459.

F. S. HAMMETT.

**Coagglutination in growing cultures.** G. CAPONE. Mogliano Veneto. *Sperimentale* 72, 429-40(1918).—By means of cross agglutination expts. with anti-typhoid, anti-paratyphoid A and B, and anticholera sera of high titer it is shown that homologous species are agglutinated to the same extent either in growing broth culture or in saline suspension. Heterologous species, however, show agglutination in higher dilns. by the former method, especially in the early hours of growth, when the no. of bacteria is not out of proportion to the relatively small amt. of secondary agglutinin present and the agglutination produced is not masked by a heavy growth. This is apt to occur in older cultures and is responsible for the lower values of the coagglutination obtained in saline suspensions. An expt. showed that after the secondary agglutinins for 2 heterologous species had been absorbed the serum retained its original titer for the homologous organism. Details and tables are given.

M. HEIDELBERGER.

**Mixed infections.** A. ZIRONI AND G. CAPONE. Moghiano Veneto. *Sperimentale* 72, 441-52(1918).—By means of bacterial aggressins derived either from cultures themselves, or from pathological exudates, it is possible to render pathogenic microbes which are innocuous by themselves. When rendered pathogenic these microbes invade the organism with the rapidity of the most pathogenic bacteria known, causing varied lesions. An anaerobe, made pathogenic in this way, produced lesions like those of malignant edema. M. HEIDELBERGER.

**Thrombosis due to blood platelets in the treatment of vascular wounds.** SILVANO MENGHETTI. Univ. Perugia. *Sperimentale* 72, 453-8(1918).—Thrombosis due to the blood platelets, and resulting usually in quick hemostasis, may be induced by the transplantation (*trapianti liberi*) of adipose tissue on to the lesion of the blood vessel (cf. *Sperimentale* 68, Nos. 1 and 4), suturing being unnecessary. M. HEIDELBERGER.

**Supposed transformation of anaerobic bacilli in gas gangrene.** G. M. FASIANI. Moghiano Veneto. *Sperimentale* 72, 459-81(1918).—In a large no. of expts. which are given and tabulated in detail it was found impossible to induce or observe any essential alteration in the characteristics of the many strains and species of gas bacilli started with. Differences in the bacteriological findings in different parts of the invaded tissues or at different times in the same tissue are not due to transformation of the bacteria but to the overgrowth of one type or another due to changing cultural conditions in the infected area. The results are in direct contradiction to those of Conradi and Bieling (*Münch. med. Wochschr.* 1916, No. 44). M. HEIDELBERGER.

**Basophilic granulocytes in leucemic blood.** N. TIBERTI. Univ. Sassari. *Sperimentale* 72, 482-96(1918).—The staining of these cells is very difficult, the best methods being that of May-Grünwald, and those involving the use of "*Dahlia acetica*" or an alc. soln. of thionin. Treatment with acetone shows the basophilic granulocytes to be composed of a lipoid fraction and an albuminoid portion. The origin of the cells is discussed. M. HEIDELBERGER.

**Etiology of dental caries.** RAGNAR ECKERMANN. Malmo, Sweden. *Dental Items of Interest* 41, 85-9(1919).—Polemic reply to Bunting's critique (*C. A.* 12, 2213). JOSEPH S. HEPBURN.

**Studies of snake venoms. III. Action of snake venoms on proteins.** B. A. HOUSSAY AND J. NEGRETE. *Rev. inst. bact. Buenos Aires* 1, 341(1918); *Physiol. Abstracts* 3, 462-3(1918).—Many of the conclusions are contained in a paper already abstracted (*C. A.* 12, 2372). The venoms of *Lachesis*, *Ancistrodon*, and *Crotalus adamanteus* possess marked proteolytic power; those of *Naja tripudians*, *Elaps marocrovi*, *Crotalus terrificus*, *Pseudechis porphyracus*, *Notechis scutatus*, and *Vipera Russellii* have this power to a slight degree. The proteolytic substances are thermolabile, and are specifically neutralized by anti-venom sera. JOSEPH S. HEPBURN.

**Specific precipitins in antiphidic sera.** B. A. HOUSSAY AND J. NEGRETE. *Rev. inst. bact. Buenos Aires* 1, 15-31(1917); *Abstracts Bact.* 2, 114-5(1918).—Horses were immunized to the venoms of *Crotalus terrificus*, *Lachesis alternatus* and *L. Newwiedi*, and their sera tested for antitoxin and precipitin. A highly potent antitoxic serum generally, but not always, possessed a high precipitin titer, which was detd. by addition of varying amts. of venom to a constant amt. of antiphidic serum. All the sera tested pptd. venoms of *Lachesis alternatus*, *L. jararacussu*, *L. Newwiedi* and *L. lanceolatus*. Characteristic pptn. curves were obtained; clouding was most marked in the tubes containing the most venom, became less marked in the following tubes, and then increased in those containing the least serum; this phenomenon was more marked in homologous than in heterologous systems. Pptn. was relatively specific; when non-specific, it was most marked if the species furnishing the immunizing venom and the pptg. venom were

closely allied; thus a serum against *L. alternatus* venom gave reactions with other venoms: very intense with *L. lanceolatus*, strong with *L. Neuwiedi* and with *L. ammodytoides*, slight with *L. atrox*, very slight with *L. jararacusú* and with *Crotalus terrificus*, no reaction with *L. flavoviridis* and with *Naja tripudians*. The optimum amt. of serum for the pptn. test closely approximated that required to neutralize the toxin (venom) used. The ppts. were more intense than those obtained with cobra venom and its antiserum, and differed from the latter ppts. in not being dissociated by heating at 72°. Venom of *L. alternatus* lost its pptg. and toxic properties on heating at 65° for 30 min. "Antiphidic sera do not yield a reaction with the blood sera of other species, nor will antiphidic sera neutralize the toxicity of the venom of other snakes. However, those sera which ppt. the snake serum will form ppts. with the venoms." J. S. H.

**Histology, histo-chemistry and pathogenesis of Dercum's lipomata.** C. MARTELLI. *Tumori* (Rome) 6, 1(1918); *Endocrinology* 2, 319-20(1918).—The histologic structure and characteristics of this type of tumor are described. The lipomatous cells chiefly contain neutral fat, mixed, in 2 to 3% of the cells, with fatty acids. Common lipins occur in greater amt.; lecithin, cholesterol, and chromolipins are present in very scant amt., if at all; Ca is absent. Such lipomata are ascribed to disturbed equil. of lipogenesis due to multiple endocrine-sympathetic disfunction, chiefly suprarenal. Adrenaline therapy produces good effects. JOSEPH S. HEPBURN.

**Preliminary report on the virulence of certain body organs in rinderpest.** WILLIAM H. BOYNTON. *Philippine J. Sci.* 13B, 127-50(1918).—The virus of rinderpest held in certain tissues of the body of diseased animals is not injured when extd. by dil. solns. of PhOH. The virus is quickly destroyed in decomposing material (tissue or blood), but retains its activity for 5 or 6 days if virulent blood be drawn under aseptic conditions and placed in sterile containers, and retains its activity for a few days longer if the blood be kept in clotted form. By extn. of certain organs with dil. PhOH soln., the activity of the putrefactive organisms is reduced to a minimum, and they exert little or no effect on the virus. For ordinary immunization work it is best not to use an ext. over 15 days old. "We have obtained a considerable number of very gratifying results with old exts. .... the animals presented no reaction to the injection. After a period of 2 weeks these animals were exposed to rinderpest by various methods, that is, by exposure to sick animals, inoculation with virulent blood, and inoculation with exts. These animals presented no ill effects from the exposures to which they were subjected, showing that they had been immunized by the primary injection of ext." Aq. exts. of liver, spleen, and lymph glands 3 days old were highly infectious to susceptible animals. Five-day-old exts. of (1) liver, spleen and lymph glands, (2) cardiac muscle, and (3) cecum and colon in 0.5% PhOH were highly infectious to susceptible animals. The ext. of liver, spleen, and lymph glands in this concn. of PhOH retained the virus in virulent form for periods varying from 8 to 35 days. When 1% PhOH was used for extn., the following results were obtained with susceptible animals: exts. of lymph glands 6, 17 and 20 days old, resp., and ext. of liver, spleen, cecum, and lymph glands 17 days old were highly infectious; ext. of liver and ext. of spleen, both 21 days old, were virulent. An ext. of spleen in 2% PhOH 5 days old was infectious to susceptible animals. The virus had become destroyed in an ext. of lymph glands in 2% PhOH, 8 days old. When spleen was extd. for 3 days with a mixt. of 1 vol. glycerol and 3 vols. H<sub>2</sub>O plus 2% PhOH, the virus was destroyed. The organs best adapted for the prepn. of exts. were: liver, spleen, lymph glands, heart, fourth stomach, cecum, and colon; skeletal muscle, larynx, pharynx, base of tongue and pancreas were not suitable for this purpose. It was advisable to use a 0.75% PhOH ext. not over 15 days old. It is suggested that similar results may be obtained with the virus of hog cholera. JOSEPH S. HEPBURN.

**Antigen for the miostagmin reaction in malignant tumors.** A. H. ROFFO. *Rev. inst. bact. Buenos Aires* 1, 53-7(1917); *Abstracts Bact.* 2, 85(1918).—A transplantable tumor of the albino rat, of 15 to 20 days' growth and free from degenerative zones, was triturated to a paste, spread on plates, dried *in vacuo*, and pulverized; 1 part of powder was digested with 30 parts of 96% alc., for 24 hrs. at 37°; the alc. soln. was then decanted; and the residue was digested with 150 cc. alc. for 24 hrs. at 37°. This alc. ext. was removed and combined with the first alc. ext.; the residue was digested with Et<sub>2</sub>O in a tightly stoppered flask for 24 hrs. at 37°. The ether ext. was added to the combined alc. exts., which were then evapd. slowly, obtaining a dark pasty mass; the latter was dissolved in a mixt. of xylene and acetone (1:5), and filtered. This new antigen was more satisfactory than that prepd. from egg lecithin, for it had a higher drop number, was more stable (the titer remained const. for several months), and was more readily prepd.

JOSEPH S. HEPBURN.

**Serum therapy in scarlet fever.** C. KLING AND G. WIDFELT. *Hygiea (Stockholm)* 1, 1-37(1918); *Abstracts Bact.* 2, 322(1918).—During the epidemic of scarlet fever in Stockholm (1916-17) serum treatment was very successful. Serum was prepd. from convalescents with healthy blood, and was of equal value whether the patient had suffered from the light, medium or severe form of scarlet fever. The blood was usually drawn during the 5th or 6th week after the first appearance of the disease, but also yielded an effective serum if drawn during the 4th or 7th week. Secondary ill results from use of the serum were never noted.

JOSEPH S. HEPBURN.

**Complement fixation test for tuberculosis in infancy and childhood.** HENRY HERMAN. *Arch. Pediatrics* 36, 32-6(1919).—The antigen of Miller and that of Petroff were used in the tests. The sera from 17 tuberculous infants and children gave 2 positive and 2 suspicious reactions. Sera from 5 children probably but not definitely tuberculous were negative with both antigens. Sera from 28 non-tuberculous infants and children gave 3 positive and 2 suspicious reactions.

JOSEPH S. HEPBURN.

**Studies in pneumonia. X. Biochemical studies of pneumonia exudates. With special reference to the mechanism of the crisis in pneumonia.** CHARLES WEISS. *Arch. Intern. Med.* 23, 395-407(1919); cf. *C. A.* 13, 473.—Pneumonia exudates contain at least two poisons: (1) specific sensitizing protein identical with pneumotoxin which is liberated on the dissolution of virulent pneumococci and (2) an extremely toxic pyrogenic albumose. There are also present normal serum proteins, albumins and globulins, leucocytes and fibrin. Neither undigested pneumococci protein nor albumin from lung tissue possessing sensitizing powers are demonstrable. The globulin fraction of the human pneumonic exudate is non-toxic and identical with normal globulin while the albumin fraction is toxic and specific. This action is ascribed to the enzymes of the exudate. The albumose fraction is very toxic although a tolerance for it can be established in rats. There were large amts. of ether-sol. substances extd. from the lungs, non-toxic and hemolysis-inhibiting. The formation of exudates is considered to be in part due to increased permeability of the endothelium of the lungs to normal substances. When there is produced an excess of antibodies, etc., the effects of the toxins and albumoses are neutralized and lysis can proceed, producing non-toxic amino acids. When this happens the system comes into equil. and there is a quick change from fever of toxemia to normal condition-crisis.

F. HULTON-FRANKEL.

**Studies on the submaxillary gland. IV. A comparison of the effect of hemorrhage and of tissue-abuse in relation to secondary shock.** ROBERT GESKILL. *Am. J. Physiol.* 47, 468-505(1919).—"Shock is looked upon in a very general way as a combined circulatory and nutritional disturbance mainly of peripheral origin. The condition is initiated by a variety of forms of tissue-abuse which produce tissue damage, transudation of



plasma and stasis of blood. The decreased blood vol., eliciting a vascular constriction, reduces the flow of blood to a level below that essential for normal nutrition and far below that essential for the deteriorated tissues. The condition is thus sustained by a disturbed nutrition and by the consequent inability on the part of the animal to recover the normal permeability of the vessels and therefore restore the normal blood vol. that is essential for an adequate flow." Suggestions for the treatment of shock are made.

J. F. LYMAN.

**The treatment of severe and progressive hemorrhage by intravenous injections.** W. G. PENFIELD. *Am. J. Physiol.* 48, 121-32(1919).—Blood pressure in dogs was maintained at shock level (40 mm. Hg) by progressive bleeding. Considering the condition of the animals according to the duration of low blood pressure, the amt. of blood lost and the degree of acidosis resulting, there was no evidence that gum-bicarbonate soln. or gum-glucose soln. is more efficacious in saving life than is an isotonic NaCl soln. In all fatal cases observed the continued fall of arterial pressure was accompanied, not by a fall of venous pressure, but by a rise. A rise of venous pressure for 20 min. or more accompanying an arterial fall was followed by a fatal outcome regardless of treatment.

J. F. LYMAN.

**The output of epinephrine (adrenaline) in shock.** G. N. STEWART AND J. M. ROGOFF. *Am. J. Physiol.* 48, 22-44(1919).—Shock (low blood pressure), induced in dogs and cats by exposure and manipulation of the intestines, by hemorrhage or by peptone injection, did not affect the rate of output of adrenaline by the adrenals. In detg. rate of output the point is emphasized that rate of blood flow from the adrenals must be considered as well as concn. of adrenaline in the blood of the adrenal veins. Strychnine increased the output of adrenaline.

J. F. LYMAN.

**Some observations upon cases of vomiting in pregnancy.** W. GILLIATT AND E. L. KENNAWAY. *Quart. J. Med.* 12, 61-80(1919).—In some forms of pernicious vomiting a stage is reached when the  $\text{NH}_4$  index of the urine shows a rapid increase in the course of a few days to values between 30 and 50. At this time the acetone substances are being produced in large amts. The term  $\text{NH}_4$  index in this paper denotes the amt. of  $\text{NH}_4$  N of the urine reckoned as a percentage of the total N. In ten women the average  $\text{NH}_4$  index was found to be 5.9 during pregnancy and 4.9 after delivery. In eleven women the av. rise of alveolar  $\text{CO}_2$  tension after delivery was 7 mm. It seems that no explanation has yet been offered of this state of acidosis during normal pregnancy. The changes observed seem too great and sudden to be the result of starvation alone. When this condition appears, abortion seems to be the only treatment which is of any avail, and rapid improvement is to be expected from it in the great majority of cases. Attention is drawn to the great scarcity in the literature of adequate analyses of the urine in this disease, especially in regard to the output of acetone substances. Further differentiation of the various forms of pernicious vomiting is required, since in some recorded cases the  $\text{NH}_4$  index is even subnormal. Such results as have so far been obtained as to the alkali reserve of the blood in pernicious vomiting suggest that  $\text{NH}_4$  is very efficiently utilized in the preservation of this reserve. Thirty-seven references are given.

JOHN T. MYERS.

**An observation upon methemoglobinemia or sulfo-hemoglobinemia.** R. A. JAMIESON. *Quart. J. Med.* 12, 81-7(1919).—A case is reported which illustrates that within a few hrs. some unknown agent may reduce a large % of the hemoglobin to methemoglobin, or an ally, and this agent must, to explain the symptoms, be supposed to introduce itself into the blood stream in considerable amt. and rapidly. The quick and apparently complete recovery points to the introduction being brought speedily to an end. The question of addiction to the use of any drug which might be responsible

for the symptoms displayed was carefully inquired into and proved entirely negative. The altered blood pigment does not appear in the urine; its fate is unknown.

JOHN T. MYERS.

Observations upon the calcium content of the blood in infantile tetany and upon the effect of treatment by calcium. JOHN HOWLAND AND W. McKIM MARRIOTT. *Quart. J. Med.* 11, 289-317(1918).—The various theories as to the pathogenesis of infantile tetany refer it to disease of the parathyroid glands, to the character of the food, to intoxication by Ca, to intoxication by guanidine or methylguanidine, or to the lack of Ca. The evidence at present available fails to confirm the majority of these theories. H. and M. have approached the problem from the standpoint of the Ca content of the blood serum. A method was devised which has shown that the normal Ca content of the serum is from 10 to 11 mg. per 100 cc. In rickets there is a moderate reduction of the Ca in some cases, but in a number of the apparently active cases studied a normal amt. of Ca has been found. In tetany, during the active symptoms, the Ca of the serum invariably is greatly reduced and may fall as low as 3.5 mg. The av. Ca content of the serum in 18 cases was 5.6 mg. In convulsive disorders other than tetany there is no reduction in the Ca of the serum. The cause of the Ca reduction in tetany has not been explained. The inorg. phosphates of the serum are not significantly increased. The Mg of the serum in active tetany is within normal limits. Tetany results at times from the administration of large amts. of  $\text{HNaCO}_3$ . There is no evidence that alkalosis is a factor in the production of infantile tetany. Cathodal hyperexcitability has invariably been accompanied by a marked reduction of the Ca of the serum. Anodal hyperexcitability has been accompanied, in the majority of instances, by a slight reduction of the Ca of the serum. Ca administration produces a prompt effect upon the course of tetany. In a few hours the spasmodic symptoms disappear. The Ca must be continued for a long time.  $\text{CaCl}_2$  administered by mouth causes an increase in the Ca of the serum coincident with the cessation of symptoms, although, in most instances, the Ca of the serum does not return to quite normal figures. The article has a bibliography of 42 references.

JOHN T. MYERS.

MORTON, HENRY H.: *Genitourinary Diseases and Syphilis*. 4th Ed. St. Louis: C. V. Mosby Co. 807 pp. \$7. For review see *J. Am. Med. Assoc.* 72, 1182 (1919).

## H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Colloids and colloid therapy. DUPLAN. *Rev. intern. med. chir.* 28, 46-9(1917); *Abstracts Bact.* 2, 119(1918).—The effects of colloid therapy are of especial interest in septicemias. Expts. demonstrate that when a leucocyte is stimulated to activity by contact with bacterial poisons it absorbs the colloidal particles with which it is placed; the relative soly. of the digested particles almost immediately influences the osmotic tension of the white cell which disintegrates, losing its nucleus or nuclei while its protoplasm dissolves.

JOSEPH S. HEPBURN.

Hemostatic action of gelatin. JUNGO ONO. *Acta Scholae Med. Univ. Imp. Kioto* 2, 271-306(1918).—Gelatin is able to accelerate clotting *in vitro* of blood and of hirudinized blood, but loses this property on long boiling of its soln., or on digestion with trypsin. Substances which agglutinate the blood corpuscles are divided into 4 groups according to the microscopic appearance of the agglutinated mass: (1) Gelatin, gum arabic, fish gelatin (*Colla piscium*), gum tragacanth, and *Althaeae* root. They cause the blood cells to collect in rouleaux which form a network. (2) Sol. starch and agar. These do not produce typical rouleaux but cause somewhat irregular clumping of the cells; inclination to net formation is less marked. The agglutination produced by both

the above groups is detected only microscopically. (3) Abrin, serum of a foreign species, and the globulin isolated from the latter. Microscopically both large and small clumps of corpuscles are produced; the cells are united so firmly that they cannot be separated by shaking; macroscopically a fine ppt. results. (4) Alum,  $\text{CuSO}_4$ , and salts. These do not exert an agglutinating action on a suspension of corpuscles previously freed from serum; microscopically, their action is like that of the third group; but the cells become somewhat smaller; macroscopically the blood becomes somewhat darker, and finally bluish brown. The members of the first 2 groups exert a pptg. action on the blood, approx. proportional to their agglutinative power. Only the members of the gelatin group accelerate coagulation of the blood *in vitro*. When administered subcutaneously, gelatin accelerates pptn. of the blood; it has no such action when introduced into the digestive canal.

JOSEPH S. HEPBURN.

**Antagonistic action of adrenaline and of hypophysis extract on the bronchiae.** B. A. HOUSSAY. *Rev. Assoc. Med. Argentina* 28, 433(1918); *Physiol. Abstracts* 3, 386(1918).—Hypophysis ext. is a bronchio-constrictor. Expts. on guinea pigs demonstrate that hypophysis ext. is always antagonistic to, never synergistic with, adrenaline, which is a bronchio-dilator. The good results obtained in asthma by association of these 2 remedies is to be ascribed to the markedly predominant favorable action of the adrenaline.

JOSEPH S. HEPBURN.

**Action of polonium on the frog-heart, immobilized by potassium-free Ringer solution.** H. ZWAARDEMAKER AND G. GRIJNS. *Arch. néerland. physiol.* 2, 500-4 (1918); *Physiol. Abstracts* 3, 428(1918).—The frog heart was perfused by means of a cannula with Ringer soln. minus its K content, until it ceased beating. It was then exposed to polonium rays, *i. e.*, a Cu plate partially covered with polonium. Out of 33 hearts studied, 19 gave negative results; 4 yielded undoubtedly positive results since the polonium rays restored the automatism. The large % of negative results is ascribed to the weakness of the rays, which were able to act only in favorable cases. Since both positive  $\alpha$  rays from Ra and U and negative  $\beta$  rays from K and Rb have the same effect, it is suggested that the automatism is connected with some colloid which requires a positive or a negative charge to maintain it as a sol or gel.

JOSEPH S. HEPBURN.

**Existence in the animal body of substances which fix the alkaloids.** W. S. v. LEEUWEN. *Arch. néerland. physiol.* 2, 650-7(1918); *Physiol. Abstracts* 3, 460(1918).—If the pilocarpine be removed after each stimulation, its action on the isolated cat intestine can be repeatedly demonstrated. The action of pilocarpine is abolished if it be mixed with macerated rabbit liver. Rabbit serum kept on ice for several days exerted a similar action on pilocarpine. When a mixt. of serum and pilocarpine was treated with dil. HCl and an excess of alc., the entire amt. of alkaloid was recovered; hence, it had been fixed and not destroyed. This conclusion was confirmed by the amt. of active poison remaining at the end of 2 hrs., when increasing amts. of pilocarpine were added to 4 equal portions of serum; the curve, representing the quantity fixed, resembled isotherms of adsorption. The substance in rabbit serum, which rendered pilocarpine incapable of stimulating the surviving intestine of the cat was not cholesterol or lecithin; it probably acted by adsorption of the alkaloid; it or its analog occurs in lesser amt. in the serum of the cat and of the ox, but is absent in that of the dog. Its presence probably explains the difference in susceptibility of the rabbit and cat to pilocarpine.

JOSEPH S. HEPBURN.

**Probable explanation of the Hermann-Straub biological reaction of morphine.** E. C. v. LEERSUM. *Arch. néerland. physiol.* 2, 689-710(1918); *Physiol. Abstracts* 3, 460(1918).—Mechanical or chem. stimulation of the rectum in mice produced an exact imitation of this reaction. The influence of small doses of morphine on the tonus of the

vesical sphincter was studied in narcotized, decerebrated, and decapitated cats, guinea pigs, and rabbits. Intravenous injections of small doses of morphine (2 mg. per kg. of body wt.) increased the tonus of the internal sphincter of the decerebrated cat from a resistance of 15 to 20 cm. to one of 40 cm. of water; the rabbit gave a similar but less marked reaction. Morphine did not reinforce the cramp of the sphincter in the decapitated cat. Hence the excitation probably occurs in the medulla, and stimulation travels by way of the pelvic nerves. The morphine reaction was prevented by section of these nerves, while their mechanical stimulation produced pronounced cramp of the sphincter. The Hermann-Straub reaction is the result of vesical and anal tenesmus.

JOSEPH S. HEPBURN.

**Combined action of narcotics and potassium cyanide on daphne.** F. J. J. BUIJTENDIJK. *Arch. néerland. physiol.* 2, 521-9(1918); *Physiol. Abstracts* 3, 411(1918).—The duration of life of daphne (water-flea) in solns. of certain narcotics (alc., urethan,  $\text{CHCl}_3$ ) was slowly increased with diminishing concn., and rapidly increased at a certain critical concn. Addition of diminishing percents. of KCN to these narcotic solns. produced a gradual increase in the duration of life. Additions of various concns. of alc. to different percents. of KCN also produced prolongation of life. However this inhibition of toxicity of KCN was not definitely established for the change from negative to positive phototropism which occurs when daphne is immersed in 3% and 2% alc. in a chamber, of which only one-half is illuminated. Therefore, the simple theory of Warburg, that the toxicity of KCN is lessened because it is repelled from the surface by the narcotic, probably is inadequate.

JOSEPH S. HEPBURN.

**Scorpions in Korea.** H. MORI. *Chosen Igakukai Zasshi* 16, 47-51(1917); *Jap. Med. Literature* 4, 10-1(1919).—The av. yield of poison from a scorpion was found to be between 0.005 and 0.02 cc.; it contained 74%  $\text{H}_2\text{O}$  and a yellowish cryst. solid; the lethal dose per kg. of body wt. was: on subcutaneous injection 0.0003 to 0.0005 cc. in the rabbit and 0.0001 cc. in the guinea pig, on intraperitoneal injection 0.0005 cc. in the rabbit and 0.0003 cc. in the guinea pig, on intravenous injection 0.0001 to 0.0002 cc. in the rabbit and 0.00005 to 0.0001 cc. in the guinea pig. A 0.1% soln. of the dried poison in saline hemolyzed the erythrocytes of the dog and of the chicken on digestion for 2 hrs. in the incubator or 24 hrs. at room temp., but had no action on erythrocytes from the rabbit, the guinea pig, the cat, and the goat.

JOSEPH S. HEPBURN.

**The blood-coagulating action of gelatin.** H. SCHMERZ AND F. WISCHO. *Mitt. a. d. Grenzgebieten d. Med. u. Chir.* 30, 90-115(1918); *Abstracts of Bacteriology* 2, 253.—Observations on man. The power that gelatin has of hastening blood coagulation is due to the Ca it adsorbs, and is proportional to the amt. of Ca present. Large doses of Ca lactate can be administered intravenously with this end in view without untoward results.

E. H.

**The mechanism of the protection of carbohydrate diet in phosphorus and chloroform poisoning.** J. P. SIMONDS. Chicago. *Arch. Intern. Med.* 23, 362-79(1919).—In P poisoning there is a rapid disappearance of glycogen from the liver. Beginning about the time of the disappearance of the glycogen there occur fatty degeneration and infiltration of the liver, increased protein metabolism, and decreased oxidation. There is a reduction of the intercellular ereptase with little or no change of the esterase content of the liver. The feeding of sugars to P-poisoned animals conserves and replenishes the hepatic glycogen and markedly diminishes the toxic effect of the P. The available data on chloroform and P poisoning, acute yellow atrophy of the liver, and eclampsia tend to show that the differences between the changes produced by P poisoning and the others are quantitative rather than qualitative. It has been suggested that an adequate supply of glycogen may affect the state of the colloid of the cell (1) by stabilizing

the emulsion and preventing its "breaking" with the throwing out of droplets of fat, and (2) by reducing the permeability of the cells to the poison. There is reason to believe that if carbohydrate is not supplied in the diet, it is obtained by breaking down of protein. In P poisoning there is a diminution of the power of the body to carry on its normal oxidative processes and at the same time an increased demand for readily oxidizable material. Since fat is more difficult to oxidize than carbohydrate it cannot supply this need. The liver tends to meet this increased demand by the transportation of fat which it cannot oxidize and by increased protein metabolism. The liver is better able to burn its own glycogen than most other substances supplied to it. Autolysis proceeds more rapidly in those livers that are glycogen-free from starvation, P poisoning or action of thyroid ext. Autolysis occurring in P poisoning is supposed to be due to reversed enzyme action. The administration of sugar replenishes the glycogen of the liver and is believed to protect the animal against P poisoning (1) by effect on the colloids of the cell, (2) by furnishing carbohydrate which seems to be essential to normal synthetic processes of protein metabolism, (3) by supplying in the most easily oxidizable form material to an organ where oxidation has been decreased by poisoning, (4) by inhibiting the process of autolysis *in vivo*, (5) by preventing the reversal of the enzyme action. The author believes that the facts justify the therapeutic use of sugar in P and chloroform poisoning, in acute yellow atrophy of the liver and possibly in eclampsia.

F. HULTON-FRANKEL.

**Dyestuffs as medicinal agents.** G. HEYL. *Color Trade J.* 4, 73-6(1919).—About 200 of the dyes known to commerce have been tested as to their therapeutic merits in addition to a few specially prepared to answer certain biological requirements. The majority of these have failed to give results. Ehrlich holds that parasites are degenerated or killed only by those chemicals (dyes) to which they are related; these are termed "parasitotrope." At the same time chemicals (dyes) related to human organs are also poisonous to the human body and are called "organotrope." Dyes can only be used for sterilizing purposes when both parasitotropy and organotropy are in proper equilibrium. Most dyes used for direct introduction into the blood are built up from benzene and Ehrlich holds that for therapeutic purposes the poison group should be attached at the top and the antidote group to the bottom of the ring. Toxicity of dyes may be due to presence of poisonous metals, as for instance As in early types of magenta, or to its especially astringent properties, besides the staining effect upon tissues. A dye that is astringent is also of low diffusibility, and this brings about acute congestion, coma and perhaps death. The first and most important property of a medicinal dye used for internal therapy is that after having done its work on the bacillus it be diffusible. Such dyes are called "eutherapeutic;" all others are named "dytherapeutic." H. gives a list of both types of dyes, with a classified table of their uses.

L. A. OLNEY.

**Selection of a type of "pe-gya" bean (*Phaseolus lunatus* var.) with a low hydrocyanic acid content, in Burma.** F. J. WARTH AND KO KO GYI. *Bull. Agr. Res. Inst. Pusa* 79, 11 pp.(1918); *Bull. Agr. Intelligence* 9, 1311.—The object of the work was to isolate strains or types of the Burma bean poor in HCN, so as to avoid poisoning attributed to this bean by London firms. After extn. of the glucoside with alc. the HCN was detd. as Prussian blue either colorimetrically or gravimetrically after ignition to  $\text{Fe}_2\text{O}_3$ . The HCN content of the parent seed varied from 0.0004 to 0.0347%. Results on one generation grown under varying climatic conditions varied from 0.0008 to 0.0325% HCN. The authors conclude that the HCN content of the bean is an inherited character which remains fairly const. in the descendants, and that there is no relation between the color of the seed and its HCN content.

T. G. PHILLIPS.

## I. ZOÖLOGY.

R. A. GORTNER.

**Phagocytosis and resorption in *Helix pomatia*.** H. J. JORDAN. *Arch. néerland. physiol.* 2, 471-6(1918); *Physiol. Abstracts* 3, 410(1918).—A ration of bread and milk, colored with powdered carmine, was fed; and the animal was killed from 24 to 48 hrs. later. The intestinal glands were colored red; and microscopic examn. showed the presence of carmine granules in large vacuoles in practically all the "resorption" or liver cells. Diffusion to a slight extent occurred when the ligatured esophagus and intestine were placed in Ringer soln. and were filled with glucose soln. isotonic with the blood, and *vice versa*. Diffusion is considered the basis of absorption; the resorption cells produce chem. changes in the direction of pptn., *e. g.*, sugar becomes glycogen. "For the first time phylogenetically in *Helix* the bowel wall is pressed into the service of nutrition as a diffusion membrane. In the higher animals, aided by the activity of the resorbing cells, it supplants the primitive method of phagocytosis."

JOSEPH S. HEPBURN.

**Physiological study of luminescence of *Watasenia scintillans* (Berry).** R. SHÖJL. *Am. J. Physiol.* 47, 534-57(1919).—See C. A. 12, 956. J. F. LYMAN.

**Carbon dioxide production during starvation in *Planaria*.** C. M. CHILD. *Am. J. Physiol.* 48, 231-57(1919).—Rate of  $\text{CO}_2$  production was detd. by change in  $p_{\text{H}}$  value of the water in which the *Planaria* grew. Starvation in *Planaria* produces, during the first few days, a rapid decrease in rate of oxidation, this continuing to decrease more slowly for several weeks, but in the advanced stages of starvation increasing. In starvation the activity of the ectoderm and body wall increases while that of the alimentary tract decreases. There is evidence that animals reduced by starvation and then fed are physiol. younger than at the beginning of starvation. J. F. LYMAN.

**Quantitative studies on the rate of respiratory metabolism in *Planaria*.** I. The effect of potassium cyanide on the rate of oxygen consumption. G. D. ALLEN. *Am. J. Physiol.* 48, 93-120(1919).—KCN added to the water containing *Planaria agilis* reduces the O consumption of the latter, *e. g.*, to 30% of the normal rate in 0.0002 M KCN. The max. effect of the KCN is almost immediate and does not change materially with time. On removal from KCN soln. the worms rapidly recover their normal level of oxidation. Lowered oxidation could not be attributed, to any large extent, to the cessation of movements due to the anesthetic effect of the KCN. There appeared to be a residual oxidation of about 20% of the normal which could not be affected by KCN. Winkler's method for O detn. was employed. J. F. LYMAN.

**Calcium in normal physiology of Phasmodae (Ins. Orth.) eggs and hatched larvae.** *Compt. rend.* 168, 127-9(1919).—Ca is present in the shells of the eggs as carbonate; it is not uniformly distributed in the shell but is mostly in a cryst. layer generally distinct from the internal wall of the exochorion. The conclusions are in accord with those of Clarke and Wheeler (C. A. 11, 1941) that the calcite is in the form of aragonite. Carbonates are absent in the egg mass, the abundant Ca being present partly as phosphate and partly in org. combination. That a large amt. of Ca is in org. combination is proved by hatching the eggs when the Ca accumulates in the Malpighian tubes as phosphate (cf. following abstr.). L. W. RIGGS.

**Reserve calcium in the female of Phasmodae; its forms of elimination in both sexes.** J. PANTEL. *Compt. rend.* 168, 242-4(1919); cf. preceding abstract.—The  $\text{CaCO}_3$  as existing in the inferior Malpighian tubes of female *Phasmodae* consists principally of spherules showing as a milk-white mass by reflected light, or colorless and brilliant by transmitted light. It is quite sol. in water, more sol. if heated, and still more sol. in solns. made alk. with KOH, NaClO,  $\text{Na}_2\text{CO}_3$ , etc. It is deposited from these solns.

generally as spherocrystals, sometimes as isolated rhombohedra. Maceration in a reduced quantity of the solvent easily brings about the entire transformation of the  $\text{CaCO}_3$  from spherules to rhombohedra. Something like this takes place in the formation of the egg shell. In both sexes Ca is eliminated principally as phosphate,  $\text{CaHPO}_4$ . In hatched larvae the phosphate is sometimes accompanied by a small amt. of uric acid or urates.  $\text{CaC}_2\text{O}_4$  has been found in the Malpighian tubes of both sexes of *Phasmidae*.

L. W. RIGGS.

**Glycogen in the chick embryo.** H. JEANETTE ALLEN. *Biol. Bull.* 36, 63-7, plates 2(1919).—"Glycogen was almost invariably present in the yolk sac from the earlier stages to chicks of 10 days." It gives to the walls of the blood vessels of this region a striking red color and under high power appears as mahogany-colored masses scattered among the cells. The progress of glycogen formation is traced in detail and illustrated by drawings. The results show "that in the chick the storage of glycogen in the embryonic tissue itself is not as extensive as in other forms, and that it does not become a well-developed function of the embryo in its earliest stages, though glycogen does appear in some of the tissues and becomes more and more abundant in later stages. The embryo depends for its energy production and building material upon the food of the yolk, a part of which is kept on hand in the form of glycogen in the yolk sac."

L. W. RIGGS.

**Demonstration of the axial gradients by means of potassium permanganate.** C. M. CHILD. *Biol. Bull.* 36, 133-47(1919); cf. *C. A.* 11, 1848, 2700, 3303.—"The use of permanganate is based on the assumption that the rate of reduction of permanganate and the consequent coloration of the protoplasm may be expected to show some relation to the physiol. condition of the parts concerned, as regards their metabolism, oxidative ability, reducing capacity or avidity or demand for O, in short to some of the essential factors concerned in the protoplasm gradients." The author used concns. ranging from 0.001 *M* down to 0.00001 *M*, most of the work being done with a concn. of 0.0001 *M* ( $M = 316$ ). The results have not only confirmed the results of the susceptibility methods, so far as the same forms have been used, but in many cases the great delicacy of the staining reaction has brought out very clearly differences not shown in the susceptibility methods with lethal concns. The results showed "that regions of high oxidation rate are most rapidly or most deeply stained in permanganate and also show the highest susceptibility as regards death and disintegration of the protoplasm in the proper concns." Summarizing the author states that "the axial gradients in many plants and animals can be very clearly and beautifully demonstrated as color gradients by the use of low concns. of  $\text{K}_2\text{Mn}_2\text{O}_8$ , the color being due to the reduction of the permanganate to  $\text{MnO}_2$  by protoplasm. Axial gradients have been demonstrated by this method in all axiate organisms thus far examd. including several algae, a diatompseudothallus, four species of protozoa, various hydroids, hydromedusae and their developmental stages, a siphonophore, actinians, developmental stages of polyclads and echinoderms, axiate appendages of polychetes, and ascidian tadpoles."

L. W. RIGGS.

**Reversibility of the heliotropism of Arenicola larvae by chemicals.** SAKYO KANDA. Kyushu Imperial Univ. *Biol. Bull.* 36, 149-66(1919).—"The free swimming larvae of *Arenicola cristata*, just after they leave the egg strings at the swarming stage, are strikingly positive to light, and were used in this study. At each trial four 100-cc. beakers were used as follows: One for control with normal sea  $\text{H}_2\text{O}$  at room temp., a second with treated sea  $\text{H}_2\text{O}$  at room temp., a third with treated sea  $\text{H}_2\text{O}$  at higher temp., and a fourth with treated sea  $\text{H}_2\text{O}$  at lower temp. Fifty cc. of liquid were used in each beaker and the beakers were set in finger bowls containing sea  $\text{H}_2\text{O}$  of the same temp. as the beaker. When all beakers were ready and fairly constant at the desired temps., larvae

were added as uniformly as possible with a pipet to each beaker. Light was admitted from one window and reflection cut off by black cloth placed behind and under the beakers. The following summary is given: At room temp. nearly all *Arenicola* larvae in the early swarming stage in normal sea  $H_2O$  are positively heliotropic. At temp. of  $30-34^\circ$  about half of the larvae became negative to light after about 5 min. of exposure. In sea  $H_2O$  made hypertonic by addition of  $NaCl$  or  $KCl$ , 20 to 35% became negative. In sea  $H_2O$  made hypertonic with  $CaCl_2$ ,  $MgCl_2$  or  $MgSO_4$  no reversal was observed. In hypotonic sea  $H_2O$  about 90% of the larvae reversed their heliotropism; reversal takes place more rapidly the higher the temp. (between  $12$  and  $32^\circ$ ). Isotonic solns. of  $NH_4$ ,  $K$ ,  $Li$ ,  $Na$  chlorides and sulfates made in sea  $H_2O$  reverse the positive heliotropism of the larvae. But isotonic solns. of  $Ca$  and  $Mg$  chlorides and sulfates in sea  $H_2O$  do not. The reversing effect of these salts seems, therefore, due to the cations. This suggests an action on the plasma membranes (cf. the membrane theory of Ostwald-Bernstein, *Arch. ges. Physiol. Pfluger's* 122, 129). The effective order of these cations is  $Na < Li < K < NH_4$ . In artificial sea  $H_2O$ , the positive heliotropism of the larvae is not noticeably different from that in natural sea  $H_2O$ . A trace of alkali makes apparently no difference. Hypertonic  $NaCl$  and  $KCl$  solns. added to the artificial sea  $H_2O$  reversed the positive heliotropism of the majority of the larvae. In  $Na$ -free artificial sea  $H_2O$ , the larvae became motionless immediately after treatment (effect of hypotony). In  $K$ -free artificial sea  $H_2O$ , many became negative to light, and remained at the bottom of the negative side of the beaker. In  $Ca$ -free artificial sea  $H_2O$ , the larvae became motionless about 15 min. after the exposure.  $Mg$  alone, therefore, cannot antagonize the toxic action of  $Na$  and  $K$  salts. In  $Mg$ -free artificial sea  $H_2O$ , many remain positive to light. This fact may be explained as an antagonistic action of  $Ca$  towards  $Na$  and  $K$  salts which acting by themselves are negativating agents. Alcohols ( $Me$ ,  $Et$ ,  $n$ - $Pr$ ,  $n$ - $Bu$ ) as used in these expts. were not favorable as negativating agents at room temp., though they are good at higher temp. The higher the alc. in the series the greater is its negativating effect. Most larvae treated with  $MeOAc$  or  $EtOAc$  became negative at higher than room temp. Other compds.,  $CHCl_3$ ,  $HCHO$ , ether and saponin, produced little or no reversal while the larvae were in the solns. except saponin at higher temps. Monobasic fatty acids are the best of all chemicals used for this work. The higher the acid in the series the greater is its negativating effect. Some narcotics "antagonize" or retard the reversing action of butyric acid. The reversing effect of a very weak concn. of butyric acid ( $0.00006 M$ ) in artificial sea  $H_2O$  is great.  $HCl$  and  $H_2SO_4$  produce negative heliotropism almost as well as fatty acids. In producing negative heliotropism  $NH_4OH$  is much more efficient than strong bases. *Arenicola* larvae treated with narcotics become negative after returning into normal sea water.

L. W. RIGGS.

## 12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Review of food laws enacted during 1918. *Am. Food J.* 14, No. 1, 24-5(1919).—  
A summary of federal and state enactments. F. POWDERMAKER.

Model egg law. *Am. Food J.* 14, No. 2, 32(1919).—The law was drawn up by food and drug control officers of the various states, representatives of the Bureau of Chemistry, the Food Administration, the State Poultry and Egg Shippers' Association and the executive committee of the National Poultry, Butter and Egg Association.

F. POWDERMAKER.

Report for 1917 of the provincial laboratory at Groningen for the analysis of food and other products. *Chem. Weekblad* 16, 145-55(1919).—In addition to routine



analyses, problems connected with the fish industry were studied. The "ripening" of salted anchovies was found to be due to a tryptic enzyme, detected by the formation of tyrosine, tryptophan and other amino acids from the albumin of the fish. Crustaceae in fish meal can be detected by the presence of chitin, which does not occur in fish. Attempts to pickle herring from the Zuider Zee were unsuccessful, because these fish lack the enzyme action which makes other herring tender when pickled. The enzyme is present, but is rendered inactive by an anti-enzyme. JULIAN F. SMITH.

**Micro-colorimetric method for the identification of wheat, rye, and potato starches in the presence of each other.** E. UNNA. *Z. Nahr. Genussm.* 36, 49-53(1918); *J. Soc. Chem. Ind.* 37, 746A.—Ten g. of the flour are steeped in 3% phenol soln. for 24 hrs., and a small portion is then transferred to a microscope slide and air-dried for 30 min. It is then treated with a mixt. of 1 g. of water-blue-orcin soln. (water-blue 1, orcin 1, glacial acetic acid 5, glycerol 20, alc. 50, and water 100 parts) and 6 drops of 1% eosin soln. (in 60% alc.); after 10 min., the prepn. is washed with water, treated for 20 min. with 1% safranin soln., again washed with water, and treated for 30 min. with 0.5%  $K_2Cr_2O_7$  soln. The prepn. is finally washed with water, alc., and xylene, mounted in Canada balsam, and examd. under the microscope. Potato starch is colored bright red, while wheat and rye starches are brownish yellow, the rye being darker than the wheat. Gluten is colored bright blue. E. J. C.

**Analysis of egg powder.** L. GARNIER. *J. pharm. chim.* 18, 353-7(1918).—A specimen of com. egg powder was light yellow, had a not unpleasant odor and taste, and showed absence of starch and sugar. Analysis per 100 g. gave  $H_2O$  8.99, org. matter 87.43, sol. ash ( $P_2O_5$  abundant) 1.55, insol. ash ( $P_2O_5$  and  $CaO$  abundant) 2.03 g. Total N was 7.83, total  $P_2O_5$  1.097,  $P_2O_5$  of lecithin 1.8123; oil of egg (fat + lecithins + lutein) 45.878 g., fat + lutein 25.32, (distearic, lecithin  $C_{44}H_{88}PNO_8$ ) 20.56 g., proteins (by difference) 41.55 g. However, when calcd. protein from total N less that of lecithin, then multiplying by the factor 6.33, the protein % of 47.28 is obtained, which agrees better with the Jürgensen ratio of 13:11 for protein: fat (in table quoted from Jürgensen, Copenhagen, *per cent. composition of human food*). G. concludes that the com. product examd. is of good quality. On the basis of 25% egg solid (Jürgensen) an av. of 58 g. total wt. (Gautier), of which 1% is shell and membranes, he calcd. that 1 hen egg corresponds to 15 g. of this powder and 1 kg. of the powder is equiv. to 66 eggs. S. WALDBOTT.

**Tests of storage and fresh eggs.** HERMAN C. LYTHERG. Mass. State Board of Health. *Am Food J.* 14, No. 1, 15(1919).—The eggs were candled and the  $NH_3$  was detd. Strictly fresh eggs contain less than 1 mg.  $NH_3$  per 100 g. of egg, reasonably fresh eggs contain as much as 2 mg. and decompd. eggs contain more than 4 mg. During Dec., 1917, and Jan. and Feb., 1918, 133 samples of eggs sold as fresh eggs and 100 of those sold as storage eggs were examd. It was found that if one asked in a retail store for cold storage eggs, the chances were 1 to 6 of getting fresh eggs. If fresh eggs were asked for the chance were even that the eggs would be of the same quality as cold storage eggs. F. POWDERMAKER.

**Behavior of various substances as preservatives of milk.** H. MOHORCIC. *Arch. Hyg.* 86, 254(1917); *Chem. Ztg.* 42, 189(1918); *J. Soc. Chem. Ind.* 38, 50A.—While the addition of Na salicylate, Na benzoate, benzoic acid, boric acid, borax,  $Na_2CO_3$ , or  $CH_3O$  retards the formation of acid in milk, so much acid is formed eventually that the milk curdles. Frequently, a higher acidity is necessary to curdle preserved milk than is required to curdle untreated milk. E. J. C.

**What do we mean by the term "standardized milk?"** I. L. VAN SLYKE. *Am. Food J.* 14, No. 3, 10(1919).—Standardized or adjusted milk is milk changed by the re-

removal of fat, thus decreasing the ratio of fat to solids not fat, or milk to which cream is added, causing an increase in the ratio of fat to solids not fat. Van S. recommends that if standardization is permitted, special licenses should be required, a minimum composition required, the % of fat stated on the label and conditions prescribed to prevent the impairment of the sanitary quality. F. POWDERMAKER.

**Milk conserves.** BALLAND. *J. pharm. chim.* 18, 363-5(1918).—Analyses of samples for army use in the Orient show the compn. to be very variable. Certain milk powders contain only traces of butter fat, others have sugar added. They slowly take from the air from 10 to 18% of  $H_2O$ . Cond. milks show even greater anomalies: 24 to 75%  $H_2O$  and up to 45% of cane sugar. Analytical results on 12 samples of cond. milks of various origin are given. Those on 4 samples of dried milks of American, English, French and Dutch are, resp., as follows:  $H_2O$  6.44, 6.11, 5.80, 8.54%; total solids 93.56, 93.99, 94.20, 91.46%, of which butter fat is 0.80, 11.18, 10.00, 0.50%; casein 26.87, 9.46, 31.50, 33.50%; lactose 32.80, 59.00, 33.76, 46.00%; sucrose 0.00, 0.00, 8.14, 0.00%; ash 5.68, 3.60, 6.75, 8.04%. S. WALDBOTT.

**The analysis and evaluation of buttermilk porridge.** J. D. FILIPPO. *The Hague. Chem. Weekblad* 16, 41-4(1919).—Buttermilk porridge is made from steamed barley and buttermilk. The *Codex alimentarius* requires that 1 l. of the porridge shall contain 0.8 of the solid constituents of 1 l. of good quality buttermilk, but makes no provision for judging as to whether the requirement has been met. For this purpose, the most significant properties are the casein content and the optical rotation. Casein is best isolated by warming with NaOH soln., with addition of sufficient 1% Na oxalate soln. to prevent any free casein from remaining in the hydrosol state. After centrifuging and pptg. with 0.5 *N*  $H_2SO_4$  and EtOH, the free casein is allowed to settle, filtered off, washed with 50% EtOH and detd. by the Kjeldahl method. The porridge should contain not less than 1.8% casein, and its rotation should be at least  $2.7^\circ$  per 100 g. JULIAN F. SMITH.

**Detection of milk in pastry.** J. GROSSFELD. *Z. Nahr. Genussm.* 35, 457-71(1918); *J. Soc. Chem. Ind.* 37, 712A.—The method proposed depends on the conversion of lactose into mucic acid. 50 g. of the sample are shaken with 500 cc. of water, filtered and 250 cc. of the filtrate evapd. to a thin sirup with the addition of 5 cc. of glacial AcOH; the sirup is treated with 100 cc. of warm 90% alc., the mixt. filtered, and the filtrate evapd. to dryness. If a large quantity of sucrose is also present, this dry residue must be dissolved in 100 cc. of alc., 100 cc. of ether added, the pptd. sugars collected after 24 hrs., and again treated with alc. and ether. In this way the lactose is cond. in the ppt. and the greater part of the other sugars removed. The pptd. lactose is heated for a short time on a water bath with 30 cc. of  $HNO_3$  (sp. gr. 1.15), the soln. filtered and the filtrate placed aside; mucic acid usually crystallizes out within 24 hrs., but may require several days. The mucic acid obtained melts at  $200-210^\circ$ , and each g. requires 9.5 cc. of *N* NaOH for neutralization. About 30% of the lactose present is converted into mucic acid. The Ca oxide content of pastry may also afford some indication as to whether milk has been used in its prepn.; pastry made without milk may contain up to 0.2% Ca oxide (calcd. on the dry substance); the presence of milk increases this quantity, but, especially if the Ca oxide content exceeds 0.35% the increase may be due to ingredients other than milk. E. J. C.

**Caffetannic acid a bugaboo.** CHARLES W. TRIGG. *Tea and Coffee Trade J.* 33, 437-9(1917).—A general consideration of caffetannic acid and the official methods of analysis. Inaccuracies and lack of significance of analysis are pointed out and recommendations are made for change of nomenclature. A bibliography is included. C. W. T.

**Caffeine-free coffee.** CHARLES W. TRIGG. *Tea and Coffee Trade J.* 34, 233-5 (1918).—A consideration of natural and prepd. caffeine-free coffees, their physiol. effects, etc. Caffeol tends to counteract the effects of caffeine. Caffeine-free coffee has a depressant action.  
C. W. T.

**The aroma of coffee.** CHARLES W. TRIGG. *Tea and Coffee Trade J.* 35, 37-9 (1918).—Differences in coffees are largely due to caffeol, which is a mixt. of destructive distn. products. Caffeols of various coffees have different compn. Physiol. effect is discussed and bibliography is given.  
C. W. T.

**Coffee oils and fats.** CHARLES W. TRIGG. *Tea and Coffee Trade J.* 35, 230-1 (1918).—Compn. of coffee oil is taken up. There is no essential oil in coffee. Fat serves to retain aroma in the bean, and its decompn. products form aromatic constituents.  
C. W. T.

**Coffee carbohydrates.** CHARLES W. TRIGG. *Tea and Coffee Trade J.* 36, 246-7 (1919).—Discussion of nature of carbohydrate content of coffee, and carbohydrates used in adulteration and prepn. thereof.  
C. W. T.

**Vinegar samples.** CHAS. W. BROWN. *Michigan Agr. Expt. Station Report* 1917, 272-4.—Analyses are given of various samples of vinegar that have been sent to the Station by farmers who have had trouble in making vinegar. The chief causes of trouble were found to be due (1) to disease, or growth of a group of bacteria in the must, favored by the use of unsound fruit, by extremely low acidity in the must, and by a tardy alcoholic fermentation; (2) to the presence in the must of high acidity which retards or prevents the work of the yeast, and which was brought about by placing the fresh juice in casks containing a quantity of vinegar; and (3) to an insufficient supply of free O for the vinegar bacteria on account of the casks being full or nearly full, and the opening completely or partly closed.  
W. H. ROSS.

**Cider- and vinegar-making qualities of Minnesota apples.** W. G. BRIERLEY. *Minnesota Agr. Expt. Station Report* 1917, 55-7.—Analyses of samples of cider show that the sugar content of Minnesota apples is not high, necessitating careful work in the prepn. and handling of the cider to be used in making vinegar. Holding weak vinegar in casks more than 5 or 6 months does not insure greater strength but often results in peculiar changes and an actual loss of strength. It is shown that cider capable of producing vinegar of standard strength will do so regardless of modifications in the fermentation procedure, if kept at ordinary room temp. under the usual methods for cask fermentation; and that cider which under ordinary conditions will not produce a standard vinegar seemingly cannot be made to develop into a standard vinegar by any common method of treatment. A list is given of the varieties of apples best suited for making sweet cider or vinegar.  
W. H. ROSS.

**Fruit juices.** FIRMAN THOMPSON. Delaware Agr. Expt. Station, *Bull.* 119, 18-9 (1918).—A report is given of a preliminary investigation on the sepn. and detn. of citric, malic and tartaric acids in fruit juices. Detns. of the H-ion concns. of the juices of ripe fruits were found to give results which were very nearly of const. value. Preliminary observations on the H-ion concns. of fruit juices at different stages of maturity also indicated surprisingly const. results which varied much less than the total or titrated acidity. This constancy of acid concn. is probably necessary for the purpose of enzyme activity.  
W. H. ROSS.

**The chemical composition of the pineapple and the materials necessary to its cultivation.** J. V. GONCALVES DE SOUSA. *Rev. Agron.* (2) 13, 26-31 (1918); *Bull. Agr. Intelligence* 9, 1200.—Results of the analysis of the whole fruit are as follows: moisture 86.78, fat 0.11, protein 0.8, fiber 0.62, ash 0.44, N-free ext. 11.22%. The K content is 0.196%. Analyses of the cultural layer, mold, etc., confirm the view that

this plant requires large amts. of K, and of N in the form of org. matter. The food removed from the soil by each 1000 plants, the fruit and plant each averaging 2 kg., is N 8.1 kg.,  $P_2O_5$  0.84 kg., K 17.5 kg., CaO 2.68 kg.

T. G. PHILLIPS.

**Brake-fern** (*Pteris aquilina*, L.) as a source of starch. A. ZLATAROFF. *Z. Nahr. Genussm.* 35, 483-4 (1918); *J. Soc. Chem. Ind.* 37, 712A.—Eleven kg. of washed and dried brake-fern roots yielded 7.6 kg. of meal, which contd.: water 8.04, starch 46.00, cell tissue 22.11, ash 10.48%. The meal had a gray color and a bitter taste, but the latter might be removed by washing and sedimentation; it appears to be more suitable as a cattle food than for bread-making.

E. J. C.

The treatment of lupines in order to eliminate their toxic properties; researches in Holland. BOODR. *Tydschrift der Nederlandsche Heidemaatschappij* 30, 68-70 (1918); *Bull. Agr. Intelligence* 9, 1210.—The lupines are covered with water and let stand 24 hrs. They are then placed in a vat of fresh water, boiled 3 hrs., and left 12 hrs. to cool. They are then removed to another vat and soaked in fresh water 12 hrs. Finally they are crushed with a wooden mallet. Cattle are not able to digest the lupines readily. Mixing with finely chopped oats straw increases their digestibility. For working oxen 22 lbs. per week per head suffice. If no concentrates are used this quantity may be doubled or trebled. The starch value for the lupine is 74.2.

T. G. PHILLIPS.

**Fruit conserves.** BALLAND. *Bull. sci. pharmacol.* 25, 344-8 (1918).—A report on the moisture, and total and reducing sugar content of various preserved fruits purchased in the French market.

F. S. HAMMETT.

The products obtained from the seed of the field mustard. ROTHEA. *Bull. sci. pharmacol.* 26, 16-20 (1919).—Analysis of the whole seed of the field mustard (*Brassica arvensis*) gave  $H_2O$ , 8.14%; ash, 4.70%; N, 21.85%; fat, 25.82%; cellulose and hydrocarbons, 39.49%; allyl isothiocyanate, 0.18%. This seed is pharmaceutically low in allyl isothiocyanate and high in fats. The seeds treated in an oil-press gave crude oil, 15.8%; oil cake, 80.8%; wastage, 3.4%. The oil cake had  $H_2O$ , 9.24%; ash, 5.49%; N, 27.31%; fat, 14.34%; sugars, 1.95%; hydrocarbons, 41.76%; and allyl isothiocyanate, 0.21%. The sp. gr. of crude oil was 0.9146, of filtered oil 0.9144; the color was brown; odor, agreeable; acidity in terms of oleic acid, crude oil 0.71%, filtered oil 0.76%; I no. 104.9; sapon. no. 177.7; acetyl no. 15.3;  $n_D^{22}$ . It can be used as a condiment.

F. S. HAMMETT.

Investigations into the composition of seaweeds with a view to their utilization as cattle food, in the Netherlands. B. R. DE BRUYN. Wageningen. *De Veldbode* 807, 504-5 (1918); *Bull. Agr. Intelligence* 9, 1213.—On a water-free basis compn. of *Zostera marina* is: albuminoids 20.6, true albumin 16.9, digestible albumin 4.2, fat 1.6, starch 38.6, crude fiber 14.8, ash 24.4, and NaCl 12.7%. Samples of *Fucaceae* were also analyzed. B. did not find tannic acid, which has been supposed to reduce the digestibility of the proteins. Before drying, salt must be washed out with soft water. Algin, a mucilaginous, nitrogenous substance occurring in many seaweeds, forms with Ca and Mg insol. compds. which would diminish the food value if hard water were used.

T. G. PHILLIPS.

**Leucaena glauca.** ANON. *Dep. Agr. Ceylon Leaflet* No. 7, 4 pp. (1918); *Planters' Chronicle* 13, 201-3; *Bull. Agr. Intelligence* 9, 1197-9.—This is a small leguminous tree, a native of tropical America, now widely distributed in southern Asia and the neighboring islands. It grows rapidly, and is used as a green manure crop, as a source of fuel and as a light shade for coffee and forest plantations. The leaves are rich in N and K and are eaten readily by cattle. The seeds are rich in N, and a valuable

food for cattle, but should not be fed to horses, as they cause an irritation of the skin. Several analyses of the seed are given. T. G. PHILLIPS.

Wood cellulose as fodder in Sweden. C. G. SCHWALBE. *Papier-Zig.* 43, 318 (1918); *J. Soc. Chem. Ind.* 38, 51-2A.—Feeding trials have been made with wood cellulose, previously treated with small quantities of acid, in order to make it tender and destroy the felting capacity of the fibers. The expts. showed a very high digestibility but a tendency to give rise to kidney irritation. The unfavorable results may be explained by the various forms in which wood cellulose is prepd. for fodder. S. points out that if the chem. treatment is not carried out correctly, undesirable side reactions may occur, with the formation of small quantities of MeOH, CH<sub>2</sub>O, formic acid, or AcOH, which are not in themselves injurious to the cattle but yet may lower the digestibility of the fodder. E. J. C.

Chemical and physical changes in apples during the ripening and storage period (SNYDER) 11D. African oil-yielding plants (PIERRAERTS) 27. Influence of temperature and hydrogen-ion concentration upon the spore cycle of *Bacillus subtilis* (ITANO, NEEL) 11C. Edible fungi (KOBERT) 11C. The feeding of troops (ANON.) 11E.

HUNZIKER, OTTO F.: *Condensed Milk and Milk Powder. Prepared for Use of Milk Condenseries, Dairy Students and Pure Food Departments.* 2nd Ed. Revized and enlarged. Lagrange, Ill. 350 pp. \$5.00.

TIJMSMA, S. AND WAAL, D. C. DE: *Onderzoek naar een verband tusschen het vetgehalte vande droge stof van kaas, het vetgehalte der kaasmelk en het oorpronkel i j k vetgehalte van de volle melk.* Friesland: Bond van Coöperatieve Zuivelfabrieken. 180 pp. For review see *Chem. Weekblad* 15, 112(1918).

Flour, etc. E. C. SUTHERLAND. *Brit.* 121,943, Sept. 12, 1918. Before treating flour, meal, or the like with a peroxide as described in 102,967, there is added to the flour or meal a substance contg. active Cl or a small quantity of free Cl to render inactive the enzymes which are able to decompose H<sub>2</sub>O<sub>2</sub>. As a substance contg. active Cl, CaOCl<sub>2</sub> may be used. As examples of materials to which the process may be applied, potato flour, rice flour, starch, manioc root, meals rendered wholly or partially sol. or dextrinized, and dextrin itself are mentioned.

## 14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW AND W. F. MONFORT.

Boiler-water treatment. *Bur. of Mines, Tech. Paper* 218, 8 pp.(1919).—This is a reprint of *Eng. Bull.* No. 3, prepd. by the U. S. Fuel Administration. The subject is discussed from the point of view of the reduction in factory heat losses by the avoidance of boiler scale. E. J. C.

Impurities in boiler water. F. F. VATER. *Power Plant Eng.*, Jan. 1, 1919, 39 pp.—A complete discussion of impurities in boiler water, their harmful effects and qual. and quant. tests. C. H. ELDRIDGE.

Water-softening plants. C. E. STROMEYER. *J. Soc. Chem. Ind.* 38, 49-50R (1919); *Water and Water Eng.* 21, 34-7.—Reviews of the permutite process and of the lime-soda are given. The lime-soda process is dependent on three factors: temp., time, and contact. The tendency of softened water to cause corrosion is attributed to the coexistence of NaCl, Na<sub>2</sub>CO<sub>3</sub>, and dissolved air in the water. Slight excess of

$\text{Na}_2\text{CO}_3$  or addition of tannin to feed water acts as a preventative. No corrosion was detected where permutite-treated water was used. M. C. PERRY.

Color of water. WILDER D. BANCROFT. Cornell Univ. *J. Franklin Inst.* 187, 459-85(1919).—Second and final installment of this paper. Cf. C. A. 13, 881.

JOSEPH S. HEPBURN.

Determination of magnesia in water. M. MONHAUPT. *Chem. Ztg.* 42, 338 (1918); *J. Soc. Chem. Ind.* 37, 558A.—A few drops of methyl orange soln. are added to 100 cc. of the water, the latter is neutralized in the cold, 5 cc. of 3% K oxalate soln. and a known excess of 0.1 N alkali soln. (equal vols. of 0.1 N NaOH and  $\text{Na}_2\text{CO}_3$  solns.) are added, and the mixt. is dild. to 200 cc. The quantity of NaOH added must be more than that of the magnesia present in the water. After filtration, 100 cc. of the filtrate is treated with 5 cc. of 2% neutral  $\text{CaCl}_2$  soln. and then titrated, without filtration of the Ca oxalate and carbonate, with 0.1 N acid. E. J. C.

Critical study of the bacterial count in water and sewage. M. F. STEIN. *Am. J. Pub. Health* 8, 820-9(1919).—A study of bacterial methods in the light of the theory of probabilities. The expected error is given expression in formula. 200 to 400 colonies per plate are most reliable. For ordinary work 3, and for accurate work 5 to 10 platings from a single sample are recommended. F. W. TANNER.

Neutralizing acid mine waters. ANON. *Eng. Mining J.* 107, 478(1919).—The advantages of the use of MgO in preference to CaO and  $\text{Na}_2\text{CO}_3$  are discussed. Only 20 parts of MgO are required as against 28 parts of CaO and 53 parts of  $\text{Na}_2\text{CO}_3$ . The  $\text{MgSO}_4$  formed is much more sol. than  $\text{CaSO}_4$ . MgO is insol. in neutral water, while much  $\text{Na}_2\text{CO}_3$  is wasted owing to its high soly. MgO is obtainable free from org. impurities which interfere with certain metallurgical processes. W. G. KOUPAL.

Remarks on active carbonic acid in connection with water supply. J. A. HEIJMANN. Heemstede. *Chem. Weekblad* 16, 105-20(1919).—A general discussion. It deals chiefly with the influence of plant and animal organisms, mostly algae and bacteria, on the amt. of free  $\text{CO}_2$  occurring in public water supplies. The conclusion is that algae should not be excluded from sand filters, because their usefulness in assimilating free  $\text{CO}_2$  outweighs any harm they may cause. JULIAN F. SMITH.

Baryta as substitute for soda in water purification. F. HUNDESHAGEN. *Z. offentl. Chem.* 24, 159-67(1918); *J. Soc. Chem. Ind.* 37, 670A.—In the softening of boiler water contg.  $\text{CaSO}_4$ , the use of  $\text{BaCl}_2$  results in the pptn. of  $\text{BaSO}_4$ , which does not form a crust to corrode the boiler. If  $\text{BaCO}_3$  is used,  $\text{CaSO}_4$  is converted into  $\text{BaSO}_4$  and  $\text{CaCO}_3$ . The process leads to some loss of  $\text{BaCO}_3$ , which is used in excess, but if the precipitant is added to the hot water, only 5-10% in excess need be used and the pptn. of Ca is complete.  $\text{Ba(OH)}_2$  reacts with  $\text{CaSO}_4$  to form  $\text{BaSO}_4$  and  $\text{Ca(OH)}_2$ . The latter is objectionable on account of its tendency to form a hard crust on the hottest parts of the boiler. In the presence of  $\text{Ca(HCO}_3)_2$ ,  $\text{BaSO}_4$  and  $\text{CaCO}_3$  are pptd. If the  $\text{CaSO}_4$  is in excess, a little  $\text{Ca(OH)}_2$  is formed, but this can be removed with  $\text{BaCO}_3$  or with  $\text{Na}_2\text{CO}_3$ . Baryta water ppts.  $\text{Mg(OH)}_2$  from Mg salts. Ba aluminate acts as a ppt. in a similar manner to  $\text{Ba(OH)}_2$ . Formulas and examples are given for calcg. the amt. of precipitant to be used for various combinations of hardening salts. E. H.

Baryta as substitute for soda in water purification. F. HUNDESHAGEN. *Z. offentl. Chem.* 24, 175-86(1918); *J. Soc. Chem. Ind.* 37, 713A; cf. preceding abstr.—H. gives examples of the cost of treatment by the baryta process for various combinations of hardening salts, as well as directions for the chem. control of the process in practice. E. H.

**Deoxidizing water to prevent pipe corrosion.** F. N. SPELLER. *Eng. Mining J.* 107, 480.—Reports are given of tests of corrosion by deoxidized water used for heating purposes. After 13 months' service wrought iron and steel plates were uncorroded. Zn and brass plates showed no pitting while the loss as a brass-steel union was 16% as against total corrosion in raw water. Speller's deoxidizer does not completely remove the  $O_2$  but considerable amts. of  $H_2$  are found between which and the  $O_2$  a proportionate ratio seems to exist which inhibits corrosion.

W. G. KOUPAL.

**Chloramine tried by New York City.** FRANK E. HALE. *Eng. News-Record* 82, 556(1919).—Treatment of Espous Creek with  $CaOCl_2$  in amts. 0.4 p. p. m. available. Cl killed trout. Mixt. of  $NH_4OH$  and  $CaOCl_2$  were tried but found that cost per unit of available Cl for chloramine was double that of hypochlorite alone. Small amts. of Cl may be effective in waters of low mineral and org. content. A given quantity of Cl in a water did the same work in the elimination of bacteria, winter or summer, regardless of temp.

FRANK BACHMANN.

**Chlorine absorption and the chlorination of water.** ABEL WOLMAN AND LINN H. ENSLOW. *J. Ind. Eng. Chem.* 11, 209-13(1919).—The significance of Cl absorption and efficient dosage in relation to the rate of absorption as effected by color, turbidity and oxygen consumed is discussed. Color readings cannot be adapted to the prediction of Cl absorption readings. Turbidity readings are not a safe index of Cl absorption for different supplies but may be adapted to individual supplies. Oxygen consumed values correlate and are independent of the source or nature of the water. The selection of an effective Cl index is discussed.

E. P. FAGER.

**Sulfur of the waters of Barèges.** J. DUFRENOY. *Compt. rend. soc. biol.* 81, 1238 (1918).—S. is one of the principal constituents of the waters of Barèges to which may be attributed the beneficial effects of sterilization and cicatrization of wounds bathed therein. The sulfides present in soln. in these thermal waters are oxidized on contact with air with production of crystd. S; this oxidation is principally due to the action of certain microorganisms. The cryst. forms of S produced were as follows, each form being constantly associated with certain microorganisms: (1) elongated needles (in the presence of colonies of leuconostoc); large, isolated, dissymmetric hexagonal tablets (in the presence of bacteria); very small octahedra and dissymmetric hexagonal tablets (in the presence of bacteria); very small octahedra and dissymmetric forms derived from octahedra (in presence of certain bacteria). All of the crystals belonged to the orthorhombic system, but presented the minor variations noted above.

H. S. PAINE.

**Rotary screens remove dirt from water at St. Paul, Minn.** ANON. *Eng. News-Record* 82, 566-7(1919).—Two motor-driven rotary screens of the drum or cylindrical type remove vegetation and solid particles from drinking water. Engineering details of designs are given.

FRANK BACHMANN.

**Significance of black sands in filters.** J. E. WELKER AND C. C. YOUNG. *J. Am. Water Works Assoc.* 5, 425-8(1918); *Can. Eng.* 35, 550.—Manganese and iron were responsible for the color. The darkening ultimately results in a decrease of filter efficiency. Carelessness and delay in washing are considered responsible.

D. K. FRENCH.

**Water pollution and fish life.** VICTOR E. SHELFORD. *J. Am. Water Works Assoc.* 5, 437-7(1918); cf. *C. A.* 12, 1224.—Pollution of water with manufacturing wastes and sewage not only decreases our fish resources but prevents their easy recovery. Investigation as to the relative toxicity of these wastes to fish in various stages of growth, the nature of the polluting substances and their removal is urged.

D. K. FRENCH.

**Water treatment at Council Grove, Kansas.** LOUIS L. TRIBUS. *J. Am. Water Works Assoc.* 5, 438-47(1918).—Alum is used as a coagulant; but instead of being all

added at one time, four applications of the necessary quantity are made at various points in the plants operation, with very satisfactory results. Prior to this method of introduction of alum, the coagulant seemed ineffective. D. K. FRENCH.

Property of certain waters with reference to their action on metals. S. W. PARR. *J. Am. Water Works Assoc.* 5, 451-3(1918).—Certain waters in Illinois running high in carbonates and bicarbonates have shown a tendency, under boiler conditions, to produce the caustic radical which decomposes  $\text{NH}_4$  salts when present, thus introducing a corrosive gas to the steam generated, which has been found to affect brass parts of certain heating systems. The trouble seemed greatest from the returns which were highly ammoniacal. D. K. FRENCH.

The deoxygenating effect of the effluent from the Miles acid process of sewage treatment. F. W. MOHLMAN. *J. Ind. Eng. Chem.* 11, 325-7(1919); cf. *C. A.* 12, 2102.—Expts. were made to det. the extent to which the dissolved O in sea water from New Haven harbor would be used up by the unoxidized  $\text{SO}_2$  in the Miles acid effluent. An effluent containing 200 p. p. m. of  $\text{SO}_2$  will reduce all of the O in 5 to 7 vols. of sea water, the O being absorbed immediately. This may cause a distinct zone of deaerated water at the outfall of the effluent. The  $\text{SO}_2$  may be oxidized by aeration before diln., the amt. of air required being much smaller than that required for the activated sludge process. The aerated effluent will not deaerate large vols. of the dilg. water. Results of expts. are shown by tables. E. P. FAGER.

The sewage disposal problem in Chicago. C. D. HILL. *Am. J. Pub. Health* 8, 833-7(1918).—A review of the method of sewage disposal for the city of Chicago is given. At the present time the rate of diln. allowed is insufficient and it will be necessary to increase the flow or, if the Federal Government should not permit the necessary diln., to install a sewage purification plant. M. C. PERRY.

Dissolved oxygen as an index of the pollution of New York Harbor. KENNETH ALLEN. *Am. J. Pub. Health* 8, 838-42(1918); *Eng. Contr.* 51, 33(1919); *Can. Eng.* 35, 531(1918).—The results of the analysis of 4,201 samples show that: there is no danger of the development of putrefactive conditions in any of the main bodies of water in N. Y. Harbor during the cold months of the year; in East River and in Harlem River there is one-half as much dissolved O in summer as in 1909, and in the rest of the harbor about three-fourths as much as in that year; the conditions in Lower East and Harlem Rivers are such that local nuisances may be looked for after several days of hot weather; the conditions of certain parts of the Hudson River and of the Upper East River are approaching those which already exist in the Lower East River.

M. C. PERRY.

Steffens-house waste water and stream pollution. WALDO S. COULTER. *Sugar* 21, 142(1919).—The present method of disposal, settling in ponds, is a public nuisance. Good results are obtained by filtering the waste waters through a fine-mesh screen, cleaned by a jet of compressed air. The screenings obtained contain little moisture and may be dried in open heaps without creating offensive odors, and sold as fertilizer. The screened liquid is filtered through sand or similar filter, and can then be directly discharged into streams. The activated sludge method of disposal may also be used, but is not so advantageous because of the short duration of the best campaign.

F. W. ZERBAN.

Poisons in sewage. G. ROMIJN. *Water, Bodem, Lucht* 1918, 78-84, 99-112; *Chem. Weekblad* 16, 83-4.—Various fishes, Crustaceae, etc., were tested with poisons likely to occur in sewage. Their sensitivity, especially to  $\text{PhNH}_2$  and its derivs., differed greatly from that of man. Many additional species of aquatic animals must



be tested before reliable conclusions can be drawn. Regulations governing sewage contamination should not be established without careful preliminary investigation.

JULIAN F. SMITH.

**Studies on the treatment and disposal of industrial wastes. I. The treatment and disposal of strawboard waste.** HARRY B. HOMMON. U. S. Public Health Serv., *Public Health Bull.* 97, 5-70(1918).—From data obtained with an exptl. plant at a small strawboard mill the following plan for the disposal of fluid waste is recommended: The waste is sedimented in large tanks for about 2 hrs., during which 50% of the suspended matter is removed. The settled waste is then removed to filters with screened cinders as the filtering medium. These filters removed most of the remaining material and practically all the carbonate alkalinity. The filtered  $H_2O$  is so purified that when dild. 1:1 with pure  $H_2O$  it will not kill fish living in it. The sludge removed twice a mo. from the sedimenting tanks and filters was dried in open beds over a layer of cinders or straw. It seems possible that the dried sludge can be used as fertilizer.

**II. The determination of the biochemical oxygen demand of industrial wastes and sewage.** EMERY J. THERIAULT AND HARRY B. HOMMON. *Ibid* 71-86.—An intensive study of the excess O method for detg. the biochem. O demand of liquid wastes was made and the method so modified as to give consistent and accurate results with sewage, strawboard mill wastes, and a variety of other industrial wastes. The summary of the results of a large no. of routine detns. of the biochem. O demand of strawboard and tannery wastes is presented. It is shown that the precision of the values obtained with different concns. is within 5% if the dilg.  $H_2O$  has an O demand of less than 0.6 p. p. m. at 20° for 10 days and the temp. and O content of the  $H_2O$  are adjusted to the incubation temp. By using  $H_2O$  with a very low O demand and adjusting its temp. and O content before making the dilns., the results are perfectly reliable if the depletions are within 20 to 90% of the initial O content. The technic of the method is also simplified considerably since fewer concns. need be put up and the same concn. can be used to derive values over different periods of time.

JULIAN H. LEWIS.

**Current views on room temperature and ventilation.** DAVID W. HORN. *Hahnemannian Monthly* 54, 1-18(1919).—Review.

JOSEPH S. HEPBURN.

**Pulp and paper from garbage** (U. S. pat. 1,294,163) 23. **Fertilizer** (U. S. pat. 1,294,080) 15. **Fertilizer** (Can. pat. 189,921) 15.

**WITTE: Die Trinkwasseruntersuchung im Felde.** Berlin: Julius Springer. 39 pp. M2. For review see *Chem. Weekblad* 15, 113(1918).

**Water-softening material.** G. H. WIDNER. U. S. 1,294,007, Feb. 11. The pat. relates to the prepn. of a base-exchanging water-softening material by levigation of clays and treatment of them with NaCl, followed by drying and baking at a temp. of 600-700° to render the material resistant to the powdering action of the water. Impurities such as Ca and Mg compds. are removed by the washing to which the clay is subjected in the preliminary treatment.

**Composition for removing and preventing formation of scale steam-boilers.** E. R. WILLIAMS. U. S. 1,294,738, Feb. 18. A boiler compd. is prepd. by mixing tannin 4-6, and graphite 1-2, with molten NaOH 145 parts.

**Removing scale from boilers.** T. WAKEFIELD. U. S. 1,293,585, Feb. 4. A soln. for removing scale from boilers is formed of  $Na_2CO_3$  5 lbs., urine 8 oz. and  $H_2O$  1 gal.

## 15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS.

J. J. SKINNER.

Tests of the influence which the microorganisms carried to the soil in sewage can have on its fertilizing power. GIULIO MASONI. R. università di Pisa, istituto di chimica agraria, *Studi e ricerche* No. 22, 295-327.—Tests were made with sewage to see if by partial sterilization and by sterilization carried to the extreme limit compatible with agr. expts. vegetation is affected differently than by supplying the sewage in its natural state. Pots were employed containing 12 kg. of ordinary earth in which for the first series of expts. buckwheat was grown and for the second series buckwheat, corn and Dolichos. The order of the expts. was pots (1) without the addition of sewage, (2) with sewage in the natural state, (3) with sewage sterilized by means of heat (boiling), (4) with sewage partially sterilized with  $H_2SO_4$  added to the extent of 1% by wt., (5) with sewage in the natural state with the addition of  $Na_2SO_4$  in quantity corresponding to the quantity of  $SO_4$  which was added with 1% of  $H_2SO_4$ . In order better to ascertain the action of the microorganisms in the sewage a second group of expts. was made using earth completely sterilized by heating to 130-140° for 8 hrs. The order of these was pots (1) with sterilized earth without the addition of sewage, (2) with sterilized earth and sewage in the natural state, (3) with sterilized earth and sewage sterilized by heat. The moisture content of these was brought to that of the preceding group of expts. by the addition of distilled  $H_2O$ . In the first series of expts. the sewage was spread on the earth; in the second it was mixed with it. With earth in the natural state sewage sterilized by boiling gave much higher yields than the untreated sewage; sewage treated with  $H_2SO_4$  gave results equal to those obtained with boiled sewage and sewage treated with  $Na_2SO_4$  gave yields better than natural sewage but slightly inferior to that with sewage treated by boiling or with  $H_2SO_4$ . With earth sterilized at 130-140° natural sewage gave yields greater than those obtained without sewage or with sterilized sewage. Comparing the results of the expts. with natural earth and sterilized earth the yield of the check pots was slightly greater for buckwheat and more so for corn in the sterilized than the natural soil. Pots with natural sewage gave nearly the same yield of buckwheat for the two soils; on the contrary, the sterilized earth gave considerably greater yields of corn. Pots with boiled sewage always gave inferior yields in the sterilized soil to those in the natural soil. ALBERT R. MERZ.

Influence of salts on the nitric-nitrogen accumulation in the soil. J. E. GRAVES, E. G. CARTER AND H. C. GOLDTHORPE. Utah Agr. Expt. Sta. *J. Agr. Research* 16, 107-35(1919); cf. *C. A.* 11, 378.—Samples of soil were treated with varying amts. of the chlorides, nitrates, sulfates, and carbonates of Na, K, Ca, Mg, Mn and Fe, and after the addition of dried blood the mixt. was incubated for 21 days at 28-30°. At the end of the period the change in  $NO_3$  was detd. The results are tabulated and shown graphically. Toxicity was generally caused by the salt as a whole and not by the negative ion, and with a few exceptions all the salts were toxic toward nitrification at a lower concn. than was the case for ammonification as reported in a previous paper. With the different salts the rise in toxicity was by no means with, and was not controlled by, the osmotic pressure. Salts which proved to be very toxic to nitrifying organisms were:  $CaCl_2$ ,  $Na_2SO_4$ ,  $Na_2CO_3$  and  $Ca(NO_3)_2$ . With the exception of  $Na_2SO_4$ ,  $Na_2CO_3$ ,  $CaCO_3$ ,  $K_2SO_4$ ,  $K_2CO_3$  and  $Fe(NO_3)_3$  all salts stimulated nitrification at some concn. The most effective were  $CaCl_2$  and  $CaSO_4$ , which increased nitrification 67% and 97%, resp. Compds. which increased  $NO_3$  production were also good plant stimulants. Several of the nitrates were found to cause large losses in  $NO_3$ , and expts. were conducted which showed this to be due, not to denitrification but to change of the N into some other form, probably protein. R. N. HARGER.

**Cultural experiments on moor lands.** H. VON FEILITZEN. *Svenska Mosekulturför. Tidskr.* 31, 16-42, 129-69(1917).—The expts. described in this report were carried out in 1915 by the Swedish Moor Culture Association at Flahult and Torestorp in Jönköping. An increase in yield of hay in a 5-year test was secured by mixing sand with the surface layer of an imperfectly decomposed peat soil. The application of the sand paid for itself with the 3rd cutting. Shallow bog soils when mixed or covered with sand also gave favorable results in the growth of different crops as compared with the untreated soils. With some crops the sand-covered plats gave best results, and the sand-mixed plats with others. Owing to the high N content of the moor soils the use of nitrogenous fertilizers on these soils was in general without result. Of the 3 P carriers, Thomas slag gave the best result, with superphosphate second and bone meal third. Early seeding as compared with late seeding gave better returns with such crops as turnips, oats, barley and potatoes. Leguminous crops grown for green fodder were not influenced much by late seeding. Results are given of variety tests made on peat soils with such crops as oats, barley, field peas, potatoes, turnips, carrots and different grass mixts.

W. H. ROSS.

**New process for the cultivation of the cereals.** CARLO ROSSI. Legnano. 8 pp. ULRICO HOEPLI. Milan, 1917.—The new process consists in the immersion of the seed for 12-14 hrs. in a 3% soln. of  $\text{NH}_4\text{NO}_3$ , 50 kg. of seed requiring 100 l. of this soln. The seed are then withdrawn, dried in the air and sown in the customary way. Seed thus treated and cultivated in soils fertilized in the ordinary manner with superphosphate and nitrate gave a 25% greater yield of wheat or corn and 30% more straw. In all the tests the treated grain appeared 3 to 4 days before the non-treated grain and maintained a distinct superiority during the entire vegetative period, though there was sometimes observed with the treated grain a tardiness in maturation. The treated grain was also much more resistant to lodging. An exact detn. of the N absorbed by the wheat seed caused a belief that this was greater than that which the plant grown from seed which had not been treated was able to absorb during its entire vegetative period from the soil fertilized with  $\text{NaNO}_3$ . Tests conducted with all precautions confirmed this and "it can be affirmed that the new system of the . . . . fertilization of seed can be substituted for the old process of fertilization of the soil and a greater production gotten than that obtained with the processes of soil fertilization." Instead of the 200 kg. of  $\text{NaNO}_3$  per hectare required in the present methods of fertilization but 6 kg. of  $\text{NH}_4\text{NO}_3$  are needed.

ALBERT R. MERZ.

**Comparative test of several nitrogenous fertilizers.** BACHELIER. *Compt. rend. acad. agr. France* 5, 168-70(1919).—Field expts. were made to compare the fertilizing value of  $\text{NH}_4\text{NO}_3$  with that of other N-containing salts as was previously done in the pot expts. of Schloesing (*C. A.* 12, 1582). Beets were used as the crop.  $(\text{NH}_4)_2\text{SO}_4$  gave better results in all cases while  $\text{NaNO}_3$  gave a larger yield when 0.600 kg. N was applied per acre and a smaller yield when 0.900 kg. per acre was used. The tests seem to confirm that the unit of N in  $\text{NH}_4\text{NO}_3$  has essentially the same value as in the other salts hitherto furnished to the trade. The beets fertilized with  $\text{NaNO}_3$ , however, were strongly attacked by the disease, "du coeur de la betterave," due to *Phoma betae* which gives a yellow color to the leaves, while those fertilized with  $\text{NH}_4\text{NO}_3$  did not suffer thus.  $\text{NH}_4\text{NO}_3$  can apparently be as easily spread as  $\text{NaNO}_3$ . ALBERT R. MERZ.

**The mineral superphosphate industry.** E. STAUB. *Chimie & industrie* 2, 123-32 (1919).—A review is given of the process used in the manuf. of superphosphate, and also of the various other processes that have been proposed for treating phosphate rock, such as (1) digestion with  $\text{NaHSO}_4$ ; (2) ignition with silica and an alkali or alk.-earth salt to form the so-called artificial slags; (3) ignition at 600-800° with equal parts of  $\text{Na}_2\text{CO}_3$ ,  $\text{CaCO}_3$  and  $\text{Na}_2\text{SO}_4$  for the prepn. of a product known as "tetraphosphate;"

and (4) digestion with  $H_2PO_4$ , obtained either by the  $H_2SO_4$  or the volatilization method, for the prepn. of double superphosphate.

W. H. ROSS.

A new phosphatic fertilizer, "tetraphosphate of lime." E. MIEGE. *Compt. rend. acad. agr.* 4, 90-7(1918).—"Tetra" was invented in 1911 by Stoppani and introduced into commerce in 1914. Up to the present its use has been restricted to Italy. It is produced by heating for several hrs. at about  $600^\circ$  a powdered mixt. of natural mineral phosphates and 6% of a reagent composed of equal parts of Na, Mg and Ca carbonates and  $Na_2SO_4$ . This is followed by cooling and quick hydration of the mass and finally mixt. with cheap inert substances in order to bring the content of  $P_2O_5$  to that of commercial superphosphates. Its use has had a remarkable development due to the satisfactory results of numerous agricultural tests. It has the advantages of not possessing causticity or acidity and consequently is not harmful to vegetation and to sacks. It does not undergo reversion; its manuf. is simple and not costly and permits of the use of low-grade natural phosphates; its reaction is very slightly alk.; the cost and selling price are lower than those of superphosphates. It has, however, in spite of its commercial name, its  $P_2O_5$  entirely in the form of  $Ca_3(PO_4)_2$ , which is almost impossible of being practically distinguished from natural phosphates and does not possess a soly. in the usual solvents exceeding these. Thus:

|                                           | Tetra. | Tetra. | Tetra. | Phosphorite. | Phosphorite. |
|-------------------------------------------|--------|--------|--------|--------------|--------------|
| % of total $P_2O_5$ .....                 | 18.85  | 19.45  | 17.30  | 15.72        | 26.50        |
| % $P_2O_5$ sol. in ammoniacal citrate.... | 0.83   | 1.00   | ...    | ...          | ...          |
| % $P_2O_5$ sol. in 2% citric acid.....    | 6.80   | 6.55   | 7.50   | 6.65         | 10.65        |
| % $P_2O_5$ sol. in $CO_2$ .....           | 8.00   | 8.40   | 7.10   | 10.00        | 5.85         |

It has been shown, however, that assimilability and soly. are not always strictly correlated and bone phosphates, guanos and bone blacks, etc., furnish at times crop yields exceeding those which more sol. fertilizers can give. Petermann and Graftian on the other hand have found that the fertilizing power of certain phosphatic slags is inversely proportional to their soly. A résumé is given of the results obtained with the use of "tetra" in expts. carried out in Italy and France. These on the whole are favorable. The scientific explanation of this efficacy of "tetra" has not yet been found.

ALBERT R. MERZ.

A new fertilizer, the tetraphosphate of lime. A.-CH. GIRARD. *Compt. rend. acad. agr. France* 4, 69-74(1918).—Announcement, résumé and discussion of the paper by Miège (cf. preceding abstract). The name is a misnomer as the  $P_2O_5$  is in the state of  $Ca_3(PO_4)_2$ . G. and Müntz long since showed that the degree of fineness and aggregation of the phosphate is one of the principal factors of the rapidity of attack of various solvents on it. The suggestion is made that in future expts. not only should "tetraphosphate" be compared with superphosphates but also with the natural phosphate. The process of its manufacture by reason of its economy of installation and simplicity of operation should be within the reach of agricultural associations and besides should permit of the utilization of numerous phosphatic deposits in France which have been abandoned because they furnish minerals too poor for conversion into superphosphates.

ALBERT R. MERZ.

The detection of the adulterants in bone superphosphates. GIULIO MASONI. R. università di Pisa, istituto di chimica agraria, *Studi e ricerche*, No. 22, 139-70.—The procedure is begun with the following preliminary tests. A little of the substance to be tested is cautiously heated in a porcelain dish until charred and then calcined with the blast lamp in a Pt dish frequently removed from the flame. A pure bone phosphate does not give any evolution of white fumes. After long calcination the dish is removed from the flame and the substance observed while the dish is still incandescent. A pure

bone phosphate should not give an intense yellow color but should remain whitish or at most very pale yellow. The residue of such calcination, cooled, should keep its white color, or should have a pale reddish tint only after the most prolonged heating. It should be almost completely sol. in hot 10% HCl or, if there be the slightest residue, the liquid should be perfectly clear after a short settling. Then the moisture, the total  $P_2O_5$ , the  $P_2O_5$  sol. in  $H_2O$  and citrate, the total  $SO_3$ , and the residue insol. in a mixt. of 20 cc. HCl + 5 cc.  $HNO_3$  + 65 cc.  $H_2O$  (using 5 g. sample of the superphosphate) are detd. Reporting the analytical results on the dry basis (100°), the following values are established, total  $SO_3$ /total  $P_2O_5 \times 100$  and total  $SO_3$ /sol.  $P_2O_5 \times 100$ , denoted as *ST* and *SS*, resp. These should not in a good bone superphosphate exceed 130 and the difference,  $SS - ST$ , should not be notable. The insol. residue of a bone superphosphate should not exceed 1.30%. Values of *SS* and *ST* much below 110 should cause a suspicion of the addition of pptd. phosphate. If the aq. soln. gives a notable reaction for Cl, pptd. phosphate is indicated. C particles detected by means of a magnifying lens in the  $H_2O$ -insol. residue indicate ashes. Effervescence with acid indicates calcareous substances such as powdered oyster shells, etc. In special cases it may be necessary to det. pyrophosphoric acid; if this is present in considerable quantity pyrophosphates or "superphosphates from pyrophosphates" are indicated. The individual adulterants are considered as follows: (1) Mineral superphosphates, in the sense that the adulteration can be made either directly with mineral superphosphate or by means of the addition of mineral phosphates to the powdered bone. The values *ST* and *SS* are higher than 130 (and the difference,  $SS - ST$ , in not a few cases may be large) and the insol. residue is notably higher than the greatest found in bone superphosphates. (2) Superphosphates of bone ash; in the same sense as before. The same criteria hold as for mineral superphosphates. (3) Superphosphates of bone black; same as (1) and (2). (4) Gypsum, added as customarily in the "mixing" or mixed directly with the superphosphate. The 2 values *ST* and *SS* are increased, the difference  $SS - ST$  is most sensitive to the possible reversion to which the gypsum can easily give rise and the insol. residue is raised. (5) Sand. Even a considerable addition while causing a diminution in the relative quantities of  $P_2O_5$  and of  $SO_3$  should not cause the values *ST* and *SS* to vary greatly but an addition, though slight, should be easily discovered by the quantity of insol. residue. (6) Calcareous substances (oyster shells and the like). If added before "working" the values *ST* and *SS* should increase while if added afterwards there should be more or less considerable effervescence on treatment of the substance with mineral acids and there may be also a certain reversion by which the difference  $SS - ST$  will be increased. In all cases the quantity of insol. residue will increase. (7) Ashes. If added during the "mixing" the values *ST* and *SS* should increase. Added afterwards they can give an effervescence on addition of mineral acids and, causing a reversion, make the difference  $SS - ST$  large. They do not make the insol. residue increase greatly but the non-calcined insol. residue shows more or less minute particles of C. (8) Superphosphates of phosphatic guanos. The addition of such superphosphates causes a change in the two values *ST* and *SS* and increases the quantity of insol. residue. (9) Pptd. phosphates. These tend to decrease the values *ST* and *SS* as well as the quantity of insol. residue. They also give an intense reaction for chlorides in aq. solns. of the substance. (10) Pyrophosphate of Ca. This product is obtained by heating mineral phosphate with  $SO_2$  in contact with air (A. Menozzi, *Agricoltura moderna* 15, 716(1909)). In the product thus obtained the  $P_2O_5$  is almost entirely insol. in  $H_2O$  and in neutral ammonium citrate; also the  $P_2O_5$  sol. in dil. citric acid is very small and not much greater than that of the phosphate before the treatment. Addition of this causes the superphosphate to contain a quantity of  $SO_3$  much less than that of an unadulterated superphosphate and causes a great difference

between the total and sol.  $P_2O_5$  as well as a large jump in the difference between *ST* and *SS*. Besides this the insol. residue is greatly increased. In doubtful cases the pyrophosphate of Ca should be detd.; it should be high, for a little pyrophosphate of Ca may be formed in the manuf. of superphosphate during the artificial drying process. (11) Simple bone meal and mineral phosphates. Added intentionally or present in the superphosphate because of insufficient action of the  $H_2SO_4$  these substances tend to lower the value *ST*. They should be detected easily by the great difference between the total  $P_2O_5$  and the sol.  $P_2O_5$  and the by difference between *SS* and *ST*. (12) Various nitrogenous substances. The method does not lend itself to detecting them directly.

ALBERT R. MERZ.

The use of ammonium citrate in the determination of phosphoric acid. A. QUARTAROLI AND A. ROGAI. R. università di pisa, istituto di chimica agraria, *Studi e ricerche* 22, 427-43.—The present official Italian method for the analysis of superphosphates is based on the use of  $NH_4$  citrate and is in substance that proposed by Appiani (*Stas. sper. agr. ital.* 28, 817(1893)). Studies carried out by Q. (C. A. 9, 31) caused the belief that there were sources of error which had not been considered nor even suspected in the analysis of Thomas slag and of mineral superphosphates, exceptionally rich in Al by this method. Beside the fact that Al and Fe in large quantity can limit and even prevent the pptn. of  $NH_4MgPO_4$  it has been observed that Mg if in sufficient excess can ppt. Fe and Al together with a variable quantity of org. matter. A series of expts. was conducted to ascertain at what concns. of  $NH_4$  citrate, of ferrous and ferric salts, of magnesia mixt., etc., the abnormal ppts. of basic salts or of Mg ferrite occur. Use was made of cupferron to det. the small quantities of Fe in the presence of a large excess of  $P_2O_5$  and Mg, as neither these nor Al had any influence on the pptn. of Fe from the HCl soln. of the ppt. obtained by means of magnesia mixt. Samples of Thomas slag were also examd. with reference to the compn. of the ppt. obtained. After soln. of the ignited ppt. in HCl, the Fe was removed with cupferron, the pyrophosphate was transformed to ordinary phosphate by boiling and the  $P_2O_5$  repptd. It is concluded from these expts. that (1) the citrate method for the analysis of slags can give rise in certain cases to serious errors, although there are 2 causes of error which in many cases tend to balance each other, pptn. of ferrites or citro-ferrites of Mg and the incomplete pptn. of  $P_2O_5$ . If the results are discordant, if the ppts. are not perfectly white, or if, heated, they have an abnormal aspect, the detn. of Fe can be made in the way indicated and the causes of error verified. In such case the elimination of Fe by means of cupferron previous to the pptn. should yield reliable results. Such procedure, however, is not in general practicable at present in com. analyses by reason of the greater complexity of the method and expenditure of time as well as because of the very high price of the cupferron. (2) In the rarer cases where it is a question of Fe or Al phosphates the citric method is inapplicable and the principle of the pptn. at all and at any concn. of  $P_2O_5$  in the presence of Fe or Al, preventing the pptn. of these metals with citric acid, can give rise to large errors. (3) The existence of the phenomena studied does not compromise the present method of the analysis of superphosphates except in some exceptional cases of superphosphates rich in Al. The choice of the concn. and of the quantity of the solns. to be used according to the official Italian method has been very fortunate, since with varying amts. of  $NH_4$  citrate and of magnesia mixt. most serious difficulties might be encountered. "Only we believe it useful, considering the influence that the concn. of the soln. of Mg has on the formation of abnormal ppts., to fix with greater exactness the compn. of it."

ALBERT R. MERZ.

The action of manganese dioxide on nitrogenous organic substances, especially amides, with regard to the use of the dioxide as a fertilizer. GIOVANNI LEONCINI AND COSIMO PIERI. R. università di Pisa, istituto di chimica agraria, *Studi e ricerche*,

22, 328-48.—A series of expts. was carried out to ascertain with what ease  $MnO_2$  oxidizes nitrogenous org. substances with the ultimate view of establishing whether oxidation may be one among the numerous actions which Mn can exert in the soil for the benefit of vegetation. Only  $NH_3$  and  $N_2O_5$  were sought after among the products of such oxidation. No  $HNO_3$  was formed by boiling 100 cc. of a 2% soln. of  $(NH_4)_2SO_4$  for 5 hrs. with 5 g. of  $MnO_2$ . Slight acidity or alkalinity had no effect. Similarly no  $HNO_3$  was obtained with a 2% soln. of  $(NH_4)_2CO_3$ . Mixts. containing 2% solns. of  $(NH_4)_2CO_3$  with variable quantities of  $MnO_2$  maintained at  $30^\circ$  in a thermostat for a varying number of days yielded no  $HNO_3$ .  $NH_4OH$  was quickly attacked while  $(CH_3)_2N$  did not show the least sign of attack by  $MnO_2$ . A very dil. soln. of egg albumin gave no sign of oxidation on boiling; a similar soln. of legumin gave a very feeble reaction for nitrate after 6 hrs. which was not, however, to be regarded as a product of the oxidation of the protein itself. In acid and in alk. solns. there was no such indication of oxidation. In neutral 2% soln. urea gave a very strong reaction for  $NH_3$  after 4 hrs. boiling with  $MnO_2$  and a very marked reaction for  $HNO_3$  after 9 hrs. In acid soln. the quantity of  $NH_3$  formed was less and the  $HNO_3$  was more quickly formed while in alk. soln. there was a rapid formation of  $NH_3$  and a slight reaction for  $HNO_3$ . The formation of  $NH_3$  was probably due to hydrolysis and not to the  $MnO_2$ . A neutral soln. of urea kept 5 days at  $30^\circ$  gave no trace of  $HNO_3$  and but insignificant quantities of  $NH_3$ . After 5 hrs. boiling of a neutral soln. of acetamide appreciable quantities of  $HNO_3$  were obtained with only traces of  $NH_3$ . Glycine and hippuric acid gave no  $HNO_3$  and only traces of  $NH_3$  in neutral, acid and alk. solns. Similarly alanine was not oxidized nor were leucine or aspartic acid. The last two compds. gave a slow formation of  $NH_3$  while alanine gave no trace of  $NH_3$ . Taurine, tyrosine and benzamide gave no reaction with  $MnO_2$ . Uric acid gave no  $HNO_3$  either at  $30^\circ$  or on boiling. A small quantity of  $NH_3$  only was formed. Xanthine and hypoxanthine, whether in neutral, acid, or alk. soln. at  $30^\circ$  or at boiling temp., gave no  $HNO_3$ . A very small amt. of  $NH_3$  was formed at  $30^\circ$  and this formation was more rapid at the higher temp. A 3% soln. of cyanamide was boiled with  $MnO_2$  with the results given in the following table:

|                                       |      |      |      |      |      |      |
|---------------------------------------|------|------|------|------|------|------|
| Hrs. of boiling.....                  | 10   | 20   | 25   | 30   | 35   | 40   |
| G. $HNO_3$ per 1000 cc. soln. present | 0.53 | 1.46 | 1.08 | 0.88 | 0.82 | 0.74 |

A 0.1% soln. of dicyanodiamide gave on boiling the following:

|                                |      |      |      |      |      |
|--------------------------------|------|------|------|------|------|
| Hrs. of boiling.....           | 2    | 4    | 6    | 8    | 10   |
| G. $HNO_3$ per 1000 cc. soln.. | 0.37 | 0.49 | 0.61 | 0.99 | 0.99 |

A 0.1% soln. of sodium cyanamide gave after an hour's boiling 0.14 g.  $HNO_3$ ; after 4 hrs., 0.45 g. The soln. also gave an abundant formation of  $NH_3$ . At  $30^\circ$  cyanamide gave neither  $NH_3$  nor  $HNO_3$ ; dicyanodiamide formed no  $NH_3$  at all but gave very small amts. of  $HNO_3$  (0.01 g. per 1000 cc. after 12 and 19 days, 0.07 g. after 26 days and a trace at end of 34 days). It is concluded that in nearly all the compds. examd. the union of the N with the remainder of the mol. is so close as to render the mol., the compds. being in aq. soln., almost absolutely refractory to the oxidizing action of  $MnO_2$  whether at a relatively low temp. ( $30^\circ$ ) or at the boiling temp., at least with respect to transforming org. N into nitric N. Exceptions to this were the amides of the acids and some polymers of these (dicyanodiamide), in which the union between  $-NH_2$  and the acid radical is very weak. The  $MnO_2$  acts on such amides in aqueous solns. as a very energetic oxidizing agent transforming the amide N into nitric N. This, however, does not take place except at the boiling temp.; at  $30^\circ$  there is no oxidation into nitric N but only the formation of  $NH_3$ . Whence it results with almost absolute certainty that in spite of the small quantity of  $NH_3$  which is formed at  $30^\circ$  such substances placed in the ground (which hardly ever exceeds this temp.) cannot exert a direct oxidizing

action of any importance upon org. nitrogenous substances. It will perhaps exert a very useful action by giving rise, through special soil conditions, to a colloidal soln. of diastatic behavior aiding the activity of bacteria, specific agents of the various oxidations which occur in the soil, and more especially the work of the nitrifying bacteria.

ALBERT R. MERZ.

The physiological effects of ammonium salts on plants. H. G. SODERBAUM. *Kgl. Landbruks-Akad. Handl. Tid.* 57, 513(1918); cf. *C. A.* 12, 1230.—The trials for 1918 were continued with oats and barley in order to det. the limits of the harmful effects of  $\text{NH}_4$  salts on these cereals. The trials were extended so as to include rye grass and vetch. The trials were made in glass cylinders each containing 29 kg. sandy soil to which needed amts. of phosphates and potash were added. The  $(\text{NH}_4)_2\text{SO}_4$  was used with  $\text{NaNO}_3$ , each in varying amts., but in such quantities that 1 g. of N was added to each pot, corresponding to 200 kg. N per hektar. The limits of the harmful effects of  $(\text{NH}_4)_2\text{SO}_4$  on oats lies between 160 and 200 kg. N per hektar, and on barley the harmful effects appear slightly with 25 kg. and strongly with 50 kg. N per hektar. With rye grass no harmful effects were observed up to 200 kg. per hektar. With vetch the effect of  $(\text{NH}_4)_2\text{SO}_4$  was most pronounced; the smallest amts. used in any pot decreased the growth of plants. This plant was also sensitive to  $\text{NaNO}_3$ , but in less degree than to  $(\text{NH}_4)_2\text{SO}_4$ . Cf. *C. A.* 12, 1230.

C. O. SWANSON.

Rate of humification of green manure. R. H. CARR. *Proc. Ind. Acad. Sci.* 1916, 398-402; *Expt. Sta. Rec.* 39, 423-4(1918).—Data are presented on humus detns. and vegetation tests with corn, obtained in investigations already noted (*C. A.* 11, 2521), from which are drawn the following conclusions relative to the rate of humification of cowpeas, alfalfa, sweet clover, and oats used as green manures: Oats practically doubled the humus content of the soil, followed by sweet clover, cowpeas, and alfalfa in the order named; alfalfa failed to show any appreciable increase. All crops showed rapid humification, there being slight increase after 2 months. Rolling under the green manures proved to be better for corn than disking in or drying. The highest corn yield was obtained after oats, with alfalfa next. Additional data are presented showing the lime requirement (Veitch method) of the soils under the various treatments at time of application and at 2 and 6 months' intervals. Increased soil acidity was observed wherever the green manures were added, the acidity being less for the disked crops than for the undisked. Where the crops were dried before mixing with the soil no appreciable increase in acidity was noted. In all cases liming resulted in increased yields of corn.

E. H.

New deposits of guano in the Philippines. *Philippine Agr. Rev.* 10, 301(1917); *Bull. Agr. Intelligence* 9, 930.—In several instances, particularly in the southern provinces of the Island of Luzon, searches have resulted in the location of extensive guano deposits. This material, however, has invariably contained a low percentage of N, which condition was due no doubt to the extremely sol. substance contg. that element having leached away during the rainy seasons. Analysis of this material showed the following av. result: N 1,  $\text{P}_2\text{O}_5$  15 and potash 1%.

E. H.

Value of Philippine composts. F. B. SARAO. *Philippine Agr. and Forester* 6, 128-34(1918); *Expt. Sta. Rec.* 39, 523.—This reports the results of observations on the rate of decompn. and shrinkage, the percentage of moisture and total N, and the increase in total N in different materials composted in walled and unwallled and shaded and open piles. The materials studied included corn, cane, and sorghum trash; mixed herbaceous plants, including tomato and pea vines and amaranthus and other weeds; rice straw; cogon (*Imperata* sp.); bamboo leaves; and banana stems and leaves. The cane trash compost showed the highest percentage of N, 0.9%, that from corn trash and



mixed herbaceous plants being next in order with 0.84% each. Banana stems and leaves showed the highest shrinkage, and together with rice straw, composted most rapidly. Cogon showed the lowest shrinkage. No relation between the rate of decompn. and the percentage of N content in the compost was observed. E. H.

The potassium salts industry in war time (BRANET) 18. African oil-yielding plants (PIERREARTS) 27. Device for sampling (RILEY) 1. The phosphate production and resources of the world (MORGAN) 18. *Leucaena glauca* (ANON.) 12. The potassium problem and the utilization of olive-oil residue in Italy (L'ABATE) 18.

The American Fertilizer Hand Book. 12 Ann. Ed. Philadelphia: Ware Bros. Co., 1010 Arch St. \$1.50.

Fertilizer. P. M. SHUEY. U. S. 1,293,220, Feb. 4. Mineral or bone phosphate is mixed with about twice its weight of molten niter cake, and after mixing for 1-3 min. and while the mixt. is still fluid it is withdrawn from the mixing app. and allowed to set, cool and age. About 87% of the insol. Ca phosphate originally present in the mixt. is converted into mono- and di-Ca phosphates.

Fertilizer. P. H. CARTER. U. S. 1,293,029, Feb. 4. A fertilizer is formed of cyanamide, niter cake and "fertilizer stick" in substantially dry form. The cyanamide and niter cake are mixed first, to avoid loss of  $\text{NH}_3$  when the "stick" is added.

Fertilizer. G. J. FOWLER and G. MUMFORD. U. S. 1,294,080, Feb. 11. A bacterially active fertilizer in granular form is prepd. from sewage sludge.

Fertilizer. G. J. FOWLER. Can. 189,921, Apr. 29, 1919. A fertilizer consisting of bacterially active non-colloidal sewage sludge rich in N in a state available for plant food is made by forcing air through sewage in the presence of bacteria, thus forming an active sludge, which is heated to sterilize and dry it. It is then inoculated with a portion of fresh active sludge.

## 16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Analysis of Portuguese Colares wines. J. V. GONCALVES DE SOUSA. *Revista Agronomica* 13, 90-3(1918); *Bull. Agr. Intelligence* 9, 1366-7.—To distinguish the Colares type of wine (1) G. analyzed 127 samples of red wine and 23 samples of white wine from these vineyards. Below are given the averages of several detns., the first figure for each value is for red wines, the second for white wines: Alc. by vol., 11.14%, 11.99%; by wt., 8.84%, 9.49%. Total dry ext. 23.41 g., 18.61 g. per l. Total acidity (expressed in  $\text{H}_2\text{SO}_4$  per l.) 4.65 g., 4.37 g. Fixed acidity (expressed in tartaric acid per l.) 5.96 g., 5.78 g. Volatile acidity (expressed in  $\text{AcOH}$  per l.) 0.95 g., 0.93 g. Ash (about 10% of the reduced dry ext.) red wine, 2.42 g. white wine 1.88 g. per l.  $\text{H}_3\text{PO}_4$  in the ash of red wine, 0.20 g., in that of white wine, 0.175 g. Reducing sugar 1.54 g., 0.99 g. per l. Glycerol 6.20 g., 6.59 g. per l. Tannin 0.81 g. per l.; 0.002 g. (it could be estd. in 3 samples only). Potassium bitartrate (by Berthelot and Fleuriu's method) 1.93 g., 0.75 g. per l. Two tables show the results obtained for each of the 150 samples of wine analyzed, and give the localities from which they came. E. H.

A new method for determining the watering of wine. I. J. PRATOLONGO. *Stas. sper. agrar. ital.* 51, 56-60(1918); *Bull. Agr. Intelligence* 9, 1104(1918).—The method reported by Pagnotta is based on the fact that natural wine forms a satd. soln. of K acid tartrate and Ca tartrate. It should be possible to calc. the amt. of  $\text{H}_2\text{O}$  added

to a wine by satg. it with K acid tartrate and detg. the difference between the tartrate dissolved and the added tartrate and residue. The soly. of K acid tartrate and Ca tartrate an hydro-alc. solns. with respect to temp. and content in alc. and tartaric acid, considered as variables, was investigated; also the influence of the chem. treatment and changes to which wine may be subjected. These investigations led to the belief that it is possible to show with certainty the watering of wine even with quantities as small as 5 to 10%; also to show the presence of other prohibited matter, such as  $H_2SO_4$ , in amts. too small to be detected by other analytical methods. When the  $H_2O$  added varies from 5 to 20% the method is quant. as well as qual.  $H_2O$  added to the must cannot be detected. The method is as follows: Sat. the wine with K acid tartrate and Ca tartrate separately by keeping in contact with them in excess for  $\frac{1}{2}$  hr. at 50-60°. Allow the excess of these salts dissolved to settle by cooling and, in the wine thus satd., det. the following (1) the difference in the amt. of K acid tartrate dissolved and the 2 comparative acidometric detns. made with non-satd. wine and wine satd. with K acid tartrate; (2) the amt. of Ca tartrate dissolved, with the detn. by wt. of the total Ca in the wine before and after satn.

ALBERT R. MERZ.

**Dependence of maltase-activity on the state of development of yeast.** F. SCHÖNFELD, H. KRUMHAAR AND M. KORN. *Woch. Brau.* 35, 175-6(1918); *J. Soc. Chem. Ind.* 38, 87A; cf. *C. A.* 12, 972, 973; 13, 988.—S. and K. detd. the maltase-activity of brewers' yeast taken from the vat at different stages of the primary fermentation. The maltase activity of the yeast was found to increase to more than twice its original value as the intensity of fermentation rose to its max., and to decline again at the close of fermentation. It is suggested that yeast taken from the vats at the most vigorous stage of the primary fermentation might be added to beer at the commencement of storage to stimulate the secondary fermentation, since it possesses greater maltase- and zymase-activities than the yeast which normally remains in the beer on leaving the vats.

E. H.

**Volumetric determination of phosphoric acid in brewing materials.** W. WÖLLMER. *Z. ges. Brau.* 41, 145-7(1918); *J. Soc. Chem. Ind.* 38, 86A.—Detailed procedure is described for applying the method of titration with alkali, using 2 indicators (cf. Smith, *C. A.* 11, 2079, 415; Fiehe and Stegmüller, *C. A.* 6, 3478) to the detn. of  $H_3PO_4$  in the ash of barley, malt, wort, or beer. The ash, after evapn. to dryness several times with HCl on a waterbath, is dissolved in 1 cc. of dil. HCl and filtered. The filtrate and washings, which should occupy 20-30 cc. and contain not more than 70 mg.  $PO_4$ , are treated with a drop of 0.1% methyl orange soln. and exactly neutralized with NaOH, a concd. soln. of the latter being used except for the final adjustment. Thirty cc. of 40%  $CaCl_2$  soln., exactly neutral to phenolphthalein, is then added, and the liquid is heated just to boiling, cooled to about 14°, treated with 2 drops of 1% phenolphthalein soln. and titrated, while being continuously agitated, with 0.1 N NaOH soln. free from carbonate. After a red coloration has been attained the liquid is allowed to stand at 14°; the color is slowly discharged and after 2 hrs. the titration is completed. The total vol. of 0.1 N NaOH used is reduced by 1% to allow for traces of carbonate unavoidably present; 1 cc. corresponds with 3.55 mg.  $P_2O_5$ . The method gives sufficiently accurate results with the materials named above, but is vitiated by the presence of considerable quantities of Fe, Al, Mn or borates.

E. H.

**The Plesch mashing process.** G. FRIES. *Z. ges. Brau.* 41, 73-5, 81-3(1918); *J. Soc. Chem. Ind.* 38, 86A.—This process is one of many mashing methods proposed during the war in Germany with a view to economizing material, fuel, and time. It involves the following operations: cold digestion of the finely ground malt overnight; withdrawal of a portion of the cold water ext. for future use; peptonization and saccharification of the mash; addition of hops (previously ground and digested with cold water) to the

mash; boiling of the hopped mash; filtration of the hot mash; cooling of the filtered wort and saccharification of any starch therein by addition of the cold malt ext. previously reserved; destruction of diastase by heating the saccharified wort to boiling. The wort is then cooled and fermented as usual. F. points out that, apart from the addition of hops to the mash, the process differs little from the Schmitz method of mashing (Brit. pat. 28,579, Dec. 3, 1897). The results were fairly satisfactory; the wort deposited only a small quantity of sludge on the cooler but developed a slight turbidity which necessitated the use of a filter-press. The dark beer produced was of good quality, but the economies claimed on behalf of the process have been greatly exaggerated. It is claimed that if the malt is very finely ground the wort from the boiled mash will require no further saccharification, but F. considers that the continued production of such a fine grist is beyond the capacity of any known malt mills. E. H.

Colloidal transformations in the boiling of mash and worts by direct flame and by steam. A. REICHARD. *Allgem. Brauer- u. Hopfenseit.* 1918; *Z. ges. Brauw.* 41, 141-3; *J. Soc. Chem. Ind.* 38, 86-7A.—In the boiling of brewery mash and worts the temp. of the floor of the Cu or other vessel is practically the same, about 120-130°, whether heating is effected by direct flame or steam jacket. R. describes expts. which confirm the view that these 2 methods of heating differ somewhat in their effects on the wort. Two series of lab. mashing and wort boilings were carried out in metal beakers under similar conditions except that heating was effected in one case by direct flame and in the other by a water- or brine-bath. In mashing, the former method of heating, as compared with the latter, led to more rapid saccharification and brighter worts, and in some cases to higher sugar-content and acidity of the worts. In wort boiling also, heating by direct flame resulted in improved "break," higher wort acidities, and more complete emulsification of hop resins. To account for these differences R. suggests that, even where the 2 methods of heating produce the same temp. in the mash or wort, the direct flame provides a surplus of radiant energy which is expended as work in the modification of colloidal complexes, *vis.*, subdivision of particles of colloids such as hop resins and enzymes, thus promoting contact of the latter with their substrates. E. H.

So-called carbohic odor of soured thin beer. W. WINDISCH. *Wochschr. Brau.* 35, 240-1 (1918); *J. Soc. Chem. Ind.* 38, 87A.—The appearance of turbidity of biol. origin in thin beers is often accompanied by a peculiar odor incorrectly described as "carbohic." It is probably due to reduction of nitrates present in the brewing water, by the bacteria responsible for the turbidity, and the liberation of free  $\text{HNO}_2$ . Yeast washed and stored with water contg. nitrates suffers in fermenting power, and such weakened yeast dies if stored in thin beer and acquires a somewhat nitrous odor. It is possible that the weakened yeast itself can reduce nitrates. E. H.

Carbon dioxide content of thin beers. F. SCHÖNFELD AND C. GOSLICH. *Wochschr. Brau.* 35, 167-8 (1918); *J. Soc. Chem. Ind.* 38, 87A.—The soly. of  $\text{CO}_2$  in beer decreases by 0.01% for a rise of 1°, and by 0.015% for a fall of 0.1 atm. pressure. It diminishes also with decrease in the content of sugars, dextrins, alc., and other constituents which contribute to the viscosity of beer, and is therefore lower for thin beers than for those of normal gravity. This difference may be compensated by storing thin beer under a relatively high pressure, but when the pressure is released there is apt to be a too copious evolution of gas from the beer. The retention of gas by beer is favored by absence of suspended matters. In the carbonation of thin beers, the conditions most favorable to retention of the gas are low temp., high pressure, intimate contact between liquid and gas, and subsequent storage of the beers for several days under a pressure of  $\text{CO}_2$ . E. H.

Production of turbidity in thin beer by yeasts and bacteria after carbonation with carbon dioxide containing oxygen. P. LINDNER. *Wochschr. Brau.* 35, 225 (1918); *J. Soc. Chem. Ind.* 38, 87A.—It is suggested that the frequent occurrence of turbidity in German war beers may be due to carbonation with CO<sub>2</sub> contg. O, which encourages the development of wild yeasts and bacteria. E. H.

The utilization of sisal waste for the production of alcohol. ANON. *Tropical Life* 13, No. 10, 155 (1917); *Bull. économique de l'Indochine* 21, No. 128 (1918); *Bull. Agr. Intelligence* 9, 988.—The expts. made in British E. Africa, show that it is possible to ext. alc. from sisal. An analysis of the juice of the leaves showed that the plants from the coast as well as those from the Highland contain 3% of sugar. At Yucatan the sugar content was never below 9.4%, and after a long, dry season reached 14.1%. Most of the alc. was made from leaves containing 12% of sugar. A yeast was isolated from sisal plants which fermented a glucose soln. but was quickly killed in the sisal ext., doubtless due to the large amts. of org. acids present. After neutralization with Na<sub>2</sub>CO<sub>3</sub> and the addition of a small amt. of glucose it was found possible for the yeast to live in the sisal ext., but no fermentation took place. F. W. SMITHER.

Levoglucozan; alcohol. A. PICTET. *Brit.* 121,725, Aug. 20, 1918. Levoglucozan is obtained by moderate heating of carbohydrates (cellulose, starch, dextrin, etc.), preferably by dry distn. *in vacuo*. According to examples, cellulose or starch is distd. at 200–300° at 12–15 mm. pressure, or sawdust is distd. at 30 mm. pressure; the product is isolated from the distillate, or is converted to glucose by boiling with dil. acid and the liquid then fermented to alc.

## 17. PHARMACEUTICAL CHEMISTRY.

W. O. EMERY.

An institute for coöperative research as an aid to the American drug industry. FREDERICK B. POWER. *J. Ind. Eng. Chem.* 11, 377–8 (1919). E. J. C.

Assay of red cinchona bark. W. PARTRIDGE. *Analyst* 44, 96 (1919).—To avoid the formation of pasty masses in extns. according to the Brit. Pharm. of 1914, the use of less H<sub>2</sub>O is advocated, thus 12 instead of 22 cc., when working with 10 g. portions of the powdered bark. Using this proportion of H<sub>2</sub>O higher contents of total alkaloids were obtained on 3 occasions, the increases being, resp., 2.02, 1.16 and 1.46% above the amts. found when the pharmacopeia instructions were followed. W. O. E.

Classification of the ingredients of tropical remedies. E. CROUZEL. *Repert. pharm.* 30, 67–8 (1919).—In order to facilitate the work of the physician in a rapid and rational formulation of prescriptions involving prepn. like powders, lotions, solns., liniments, mixts. and pomades, the various ingredients likely to be required are brought under the following heads: Alcohols, ethers, aldehydes, acids, alkalies and oxides, fats and soaps, hydrocarbons, salts, vegetable products, and miscellaneous products. W. O. E.

Estimation of crude filicin and filicic acid in male fern extract. PERRIN. *Repert. pharm.* 30, 65–6 (1919).—The method outlined is essentially an elaboration of procedures given in the Brit. and Swiss pharmacopeias. W. O. E.

Pharmaceutical legislation. New decree concerning the application of the law of August first 1905 relating to the suppression of frauds. *Bull. sci. pharmacol.* [2] 26, 75–86 (1919).—A transcript of the new regulations undoubtedly of interest to exporters. F. S. HAMMETT.

**Notes on the analysis and solubility of the quinine tablets sold in the colonies.**  
 V. BOUCHER. Porto-Novo. *Bull. sci. pharmacol.* [2] 26, 66-74(1919).—Ten 0.25-gram quinine tablets are dissolved in 100 cc. distd.  $H_2O$  and 25 cc. of the soln. is extd. with  $CHCl_3$  in the presence of ammonia. The sepd.  $CHCl_3$  is evapd. and dried and the residue weighed directly as quinine. There is some loss in drying which is done away with by putting 25 cc. of the soln. in 50 cc. 0.1 *N*  $HCl$ , 20 cc. of which is titrated with 0.1 *N*  $NaOH$  using rosolic acid as indicator and 20 cc. using phenolphthalein. The difference between the volumes of  $NaOH$  used times 0.0324 gives the amount of quinine in one tablet. Direct titration of the hydrochloride can be done and gives results almost identical with those obtained on the ext. A table is appended giving the amts. of quinine found in various lots assayed. A table of the soly. is also given based on the soln. in 0.09%  $HCl$  at 38° for two hours.

F. S. HAMMETT.

**The seed oils from oranges.** I. S. KOBAYASHI. *Kogyo-Kwagaku Zasshi (J. Chem. Ind. Japan)* 21, 1235-45(1918).—The air-dried seeds from the fruits of *Sinensis* Engl. (yield 2%), of *Fortunella Japonica* Swingle (3.7%) and of *Junos* Mak. (9.50%) were crushed into small pieces and the oils extd. with petr. ether. The oils were purified by steam distn. and in the latter 2 cases the oils were treated with Kambara-clay (10%) for decoloration. The phys. and chem. properties of the oils and fatty acids obtained from them, were studied.

| Seed:                    | <i>Sinensis.</i>   | <i>Fortunella.</i>    | <i>Junos.</i> |
|--------------------------|--------------------|-----------------------|---------------|
| $H_2O$ .....             | 44.67              | 39.06                 | 10.60         |
| Crude fat and oil.....   | 19.52              | 25.50                 | 21.88         |
| N.....                   | 1.71               | 1.38                  | 2.39          |
| Crude portein.....       | 10.68              | 8.66                  | 14.94         |
| Non-nitrogenous subs..   | 18.70              | 17.25                 | 44.63         |
| Fiber.....               | 4.68               | 7.23                  | 5.41          |
| Ash.....                 | 1.75               | 2.30                  | 2.53          |
| Oil:                     | <i>Sinensis.</i>   | <i>Fortunella.</i>    | <i>Junos.</i> |
| Color.....               | pale golden yellow | brown-yellowish green | golden yellow |
| Nature.....              | semi-drying        | semi-drying           | semi-drying   |
| $d_{40}^0$ .....         | 0.9200             | 0.9223                | 0.9221        |
| $n_D^{20}$ .....         | 1.422              | 1.4730                | 1.4720        |
| Acid value.....          | 0.90               | 1.05                  | 4.97          |
| Sapon. value.....        | 192.7              | 193.4                 | 195.1         |
| I value (Wijs).....      | 105.27             | 113.03                | 100.42        |
| Unapon. matter.....      | 1.22%              | 1.22                  | 1.28          |
| Fatty acids { solid..... | 27.1%              | 19.1%                 | 22.2%         |
| { liquid....             | 66.2%              | 74.7%                 | 71.3%         |
| M. p. of fatty acids.... | 58-58.5°           | 52-52.5°              | 52-53°        |
| I value { solid.....     | 5.82               | 34.23                 | 43.71         |
| { liquid....             | 142.85             | 137.29                | 130.54        |
| Neutraliza- { solid..... | 213.5              | 205.8                 | 199.2         |
| tion value { liquid....  | 193.3              | 193.6                 | 196.8         |

S. KOMATSU.

**The analysis of extracts of belladonna and the unification of analytical methods.**  
 A. GORIS AND F. BRAUSSE. *Bull. sci. pharmacol.* [2] 26, 53-9(1919).—A comparison of the results obtained on exts. of belladonna using the methods of assay given in the British and French pharmacopeias shows such divergent results that a standardization of method of assay is indicated. The losses occurring when the British method is used can be traced in part to the complicated and numerous manipulations and in part to the evapn. of the volatile alkaloids. The procedure of the French Codex is recom-

mended because of its simplicity and because it gives results as total alkaloids while the British method yields only atropine and hyoscyamine. F. S. HAMMETT.

**Preparation and care of homeopathic remedies.** WILLIAM RAYMER. *Hahnemannian Monthly* 54, 158-63(1919).—The prepn. of homeopathic tinctures is described. JOSEPH S. HEPBURN.

**Erythrophleine hydrochloride as an agent for devitalizing the dental pulp.** NORMAN BLACK. Univ. St. Andrews. *Dental Cosmos* 61, 296-8(1919).—Erythrophleine occurs in the bark of *Erythrophloeum guineense* (sassy, casca, or ordeal bark). A 50% soln. of its hydrochloride in eugenol is known as throphleol, and completely devitalizes a dental pulp, on the av. in 36 hrs., usually without more than the merest suggestion of pain. It apparently acts upon the pulp by denying the latter its blood supply. JOSEPH S. HEPBURN.

**Removing nicotine from tobacco.** R. SAYRE and E. YANOVSKY. U. S. 1,294,310, Feb. 11. Tobacco is immersed in an infusion containing the constituents other than nicotine which are normally present in tobacco. After the nicotine has been extd. from the tobacco, the latter is removed from the infusion and pressed sufficiently to leave approx. the amts. of sol. constituents other than nicotine which are normally present in tobacco. The amt. of such sol. constituents present in the soln. before the tobacco is removed from it is substantially equal to the amt. originally present in the tobacco multiplied by the ratio of the amt. of the solvent used to the amt. of such solvent finally adhering to the tobacco. Nicotine is pptd. from the infusion by the addition of tannic acid or a tannate.

**Calcium tannate sparingly soluble in dilute acids.** KNOLL & Co. Ger. 306,979, 306,857, 1918. If basic Ca tannate is heated for some time at a high temp., it becomes sparingly sol. in dil. acids; a prepn. which had been heated for 6 hrs. at 140-150° had the compn.  $\text{Ca}(\text{OH})\text{C}_{14}\text{H}_8\text{O}_6$ , and is recommended for treatment of dysentery. The modification described in the second patent consists in heating solns. of tannic acid with the quantity of  $\text{Ca}(\text{OH})_2$  necessary for the production of the desired basic salt until the requisite sparing soly. of the basic Ca tannate in dil. acids is attained.

**Derivatives of cystine, soluble in water.** BERNHARD STUBER. Ger. 307,858, 1918. The sparingly sol. compds. of cystine and its derivs. with Hg,  $\text{HgCl}_2$ , or Ag are dissolved in soln. of NaCl, NaBr, NaSCN, or LiCl, and the solns. are treated with an excess of acetone, MeOH or EtOH, or ether; the ppts. are filtered and dried *in vacuo*. Complex salts of amphoteric character are obtained which are expected to find therapeutic application. The following substances are particularly described: cystine-mercury NaCl, yellow powder; cystine-mercury NaBr, brown powder; cystine-mercury LiCl, yellowish white powder; cystine-mercury NaSCN, yellowish brown powder; cystine-silver NaCl, brown powder; cystine-mercury chloride NaCl, white powder, cystine-mercury chloride NaBr, brown powder.

**Mercurous amino compounds.** SCHWEIZ. SERUM- & IMPFINSTITUT. Ger. 307,893, 1918. The compds. are prepd. by the action of one or more mols. of a mercurous salt on 1-phenyl-2,3-dimethyl-5-pyrazolone-4-sulfonamide. The substance obtained with  $\text{Hg}_2\text{SO}_4$  (1 mol.) is a grayish white, cryst. mass, which darkens and swells when heated; it is specifically lighter than  $\text{Hg}_2\text{SO}_4$ , and contains 40% Hg. On treatment with alkali it yields a ppt. of Hg and a sol. mercuric amino compd., which is pptd. by  $\text{H}_2\text{S}$  after acidification with HCl. With two mols. of  $\text{Hg}_2\text{SO}_4$  a complex substance is formed. The compds. are stable in substance and also when emulsified with fats. They have marked bactericidal and spirilloidal properties.

**Bromolecithalbumin and bromolecithin.** P. BERGELL. Ger. 307,490, 1918. Lecithalbumin is treated with Br in anhydrous, indifferent org. solvents, and, when required, the bromolecithalbumin is decomposed into bromolecithin and albumin according to the method of converting lecithalbumin into lecithin. Bromolecithalbumin is a pale yellow, almost odorless powder with a faintly acid taste and reaction; it contains about 16.6% of Br. It is transformed by Me or Et alc., slowly in the cold, more rapidly on warming, into albumin and bromolecithin contg. up to 25% of Br.

**Hydrogenated alkaloids.** C. F. BOEHRINGER & SÖHNE. Ger. 307,894, addition to 306,939, 1918 (C. A. 13, 636). The addition of H to alkaloids or their salts in the presence of small quantities of the finely divided suboxides of the Ni group at temps. not exceeding 60° can also be effected in alc. suspension or soln. The prepn. of dihydroquinine from quinine monohydrochloride and the hydrogenation of cinnamylcocaine are cited as examples.

## 18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

**The industrial fellowships of the Mellon Institute.** R. F. BACON. *J. Ind. Eng. Chem.* 11, 371-4(1919). E. J. C.

**France's chemical industries as they are.** CAMILLE MATIONON. *Chem. Eng.* 27, 55-8(1919). E. J. C.

**Operations and properties of the Texas Gulf Sulphur Company.** ANON. *Eng. Mining J.* 107, 555-7(1919); illus. E. J. C.

**Report of the Alien Property Custodian on the chemical industry.** A. MITCHELL PALMER. *J. Ind. Eng. Chem.* 11, 352-65(1919).—The chapter of the report entitled "The Chemical Industry" is given in full. E. J. C.

**The application of a chemical laboratory to a departmental store.** G. W. SCOTT. *Can. Chem. J.* 3, 115(1919). E. J. C.

**Concentration of sulfuric acid by the Krell-Strzoda tube system.** W. STRZODA. *Z. angew. Chem.* 31, I, 185-7(1918); *J. Soc. Chem. Ind.* 37, 688-9A.—In the Krell-Strzoda process of concn. (Brit. pat. 26,732 of 1913, C. A. 9, 1230), the concn. tubes and certain other parts are made of an acid-resisting iron enclosed in a shell of cast iron, the intermediate space being filled with an acid-proof cement, which seals any cracks which may appear in the brittle acid-resisting iron during use. The concg. tubes are arranged parallel on the slightly inclined bed of a furnace. They are connected with each other and with the distillate receiver in such a manner that the acid passes from the first tube to the second, and so on through the series to the acid cooler and receiver. The distillate is taken from the top of a crescent-shaped bend in the connection between each 2 tubes to a cooler and receiver. In a small Krell-Strzoda plant of up to 6 tubes, the production is somewhat less than 0.9 ton of 97.98% acid per tube per 24 hrs., and 0.9-1.0 ton with more than 6 tubes. The coal consumption is about 4 cwt. per ton of 97-98% acid. Instead of condensing the distillate in water-cooled lead pipes, H. Petersen passes the hot vapor up a small tower, in which it is dissolved by a descending stream of 50% chamber acid, yielding acid of 85-90%, which is then passed through the concg. app. Advantages claimed for this process are that the working conditions are easy to control, a comparatively short time is required for the construction of the plant, for subsequent repairs or renewals and cleaning, and that a colorless, clear, pure quality of acid is produced. It is essential that the tubes be kept clean and free from slime and incrustation, as otherwise they are burned and soon require renewal. E. J. C.

**Manufacture of sulfuric acid by the ferric oxide contact process.** H. DITZ AND F. KANHÄUSER. *Z. angew. Chem.* 31, I, 149-50, 153-6(1918); *J. Soc. Chem. Ind.* 37, 577A.—In the manuf. of  $\text{H}_2\text{SO}_4$  by the  $\text{Fe}_2\text{O}_3$  contact process (*Z. angew. Chem.* 15, 809-11(1902); *Z. Elektrochem.* 11, 373-84(1905); *C. A.* 2, 1864) the burner gases are first brought into contact with  $\text{Fe}_2\text{O}_3$  at a high temp., 50 to 60% of the  $\text{SO}_2$  being converted into  $\text{SO}_3$  while the As is retained by the contact mass. The gases are then cooled, and, after absorption of the  $\text{SO}_3$  by means of  $\text{H}_2\text{SO}_4$ , are brought into contact with a Pt mass whereby the oxidation is completed. Samples of  $\text{H}_2\text{SO}_4$  deposited in the fan casing of a plant had the following compn.:  $\text{H}_2\text{SO}_4$ , 97.82 and 97.01;  $\text{PbSO}_4$ , 1.28 and 1.04; Fe, 0.104 and 0.006;  $\text{SeO}_2$ , 0.161 and 0.058; selenic acid, 0.008 and 0.014;  $\text{As}_2\text{O}_3$ , 0.014 and 0.007; and  $\text{SO}_2$ , 0.012 and 0.064%, resp. Expts. showed that  $\text{PbSO}_4$  when heated with  $\text{H}_2\text{SO}_4$  alone, was only slightly volatile, but that in the presence of elementary Se or  $\text{SeO}_2$ , the volatility was greatly increased. The high proportion of Pb in the acid was contrary to recorded statements of Lunge and Marshall, but the authors have shown (*C. A.* 11, 554) that 98 to 100%  $\text{H}_2\text{SO}_4$  is able to dissolve a large proportion of Pb. The presence of Se has probably an unfavorable influence on the oxidation of the  $\text{SO}_2$ . The process should convert up to 95% (usually about 92%) of the S burned, but in a plant studied the yield was sometimes less than 90%. This was probably partly due to the toxic action of the As in the gases upon the Pt contact mass, but it was also possible that Se and Pb compds. in the burner gases had an influence on the activity of the  $\text{Fe}_2\text{O}_3$  contact mass.

E. J. C.

**Some observations on sulfuric acid plants (new and old).** IX. "P." *Gas World* 70, No. 1806 (Coking and By-products Sec.) 18-9(1919); cf. *C. A.* 13, 771, 891.—Marketing and burning of pyrites are discussed.

J. L. WILEY.

**New ammonia synthesis.** H. HAMPEL AND R. STEINAU. *Chem. Ztg.* 42, 489 (1918); *J. Ind. Eng. Chem.* 11, 368(1919).—Particulars given are meager and the app. is not described. The authors point out that both the H and N should be used in the at., not the mol. state. The H is generated and used in the nascent condition; whether or how they dissociate their N is not stated. They start from  $\text{NH}_4\text{Cl}$  which is heated in presence of iron filings and decomposes thus:  $\text{Fe} + 2\text{NH}_4\text{Cl} = \text{FeCl}_2 + 2\text{NH}_3 + 2\text{H}$  and this H is the H utilized. When the reaction takes place in presence of N, the H is bound according to the equation  $3\text{Fe} + 6\text{NH}_3 + 6\text{HCl} + 2\text{N} = 3\text{FeCl}_2 + 6\text{NH}_2 + 2\text{NH}_3$ , and this reaction gives 2 mols. of  $\text{NH}_3$  more than the  $\text{NH}_3$  started with. This constitutes the yield of the method. The 6 mols. of  $\text{NH}_3$  are passed into the soln. of the  $\text{FeCl}_2$  to ppt. the Fe as hydroxide while the  $\text{NH}_4\text{Cl}$  is recovered and the  $\text{Fe}(\text{OH})_2$  is reduced by water gas.

E. J. C.

**Potash from brackish lakes in South Plains region of West Texas.** ANON. *Manufacturers Record* 75, No. 13, 87(1919).—The salt-encrusted surfaces of many of these lakes contain potash in com. percentages. An exploitation scheme is discussed.

E. J. C.

**The potassium problem and the utilization of olive oil residue in Italy.** G. L'ABATE. *Bull. Agr. Intelligence* 9, 931(1918).—Sources of K in Italy are the mother-lyes of the salt-springs, the leucites of Latium, the ashes of wood and other vegetable products (almond shells, exhausted olive cake), distillery waste and the hitherto untested source, the residue from the manuf. of olive oil. Samples of this from the province Bari gave, per l.:  $\text{H}_2\text{O}$ , 884-891 g.; mineral matter, 30.65-35.48 g.; org. matter, 79.85-80.60 g.; fat, 10.50 g.; N, 10.0 g. The ash obtained from this gave:  $\text{H}_2\text{O}$ -sol. matter, 80.31%;  $\text{H}_2\text{O}$ -insol. matter, 19.09% (C, Si, CaO, MgO and 8%  $\text{P}_2\text{O}_5$  combined with Ca, Fe and Al);  $\text{K}_2\text{CO}_3$ , 55.15%;  $\text{Na}_2\text{CO}_3$ , 2.57%; KCl, 21.89%;  $\text{K}_2\text{SO}_4$ , trace;  $\text{H}_2\text{O}$  and undetd., 20.39%. This gave a refined product containing 68.88%  $\text{K}_2\text{CO}_3$ , 27.27% KCl



and 3.2%  $\text{Na}_2\text{CO}_3$ . The olive oil residues of Apulia give more than 30 g. K salts per l. with 48% of K as carbonate (50–60%) and chloride (15–20%). They represent almost 3 times the amt. of oil produced or 30–40% of the wt. of the olives. If all the residue in Italy were used 294,000 cwt. of crude K salts would be obtained. The N may also be utilized as  $(\text{NH}_4)_2\text{SO}_4$  and KCN (secured by Effront's method). The treatment of the residues in factories is essentially a problem of transport. ALBERT R. MERZ.

**Potash recovery.** N. H. GELLERT. Philadelphia. *Chem. Met. Eng.* 20, 308–9 (1919).—A comparison is made of the data published by Grasty (*C. A.* 13, 61) and by Bradley (*C. A.* 13, 61) on the production and cost of recovery of  $\text{K}_2\text{O}$  as a by-product in the blast furnace industry. Although using practically the same original data, it is shown that both authors arrive at entirely different conclusions respecting the amt. and value of the recoverable  $\text{K}_2\text{O}$ . Estimates are given of the cost of operating the Cottrell system for the removal of the dust from blast furnace gases, and it is considered that the net revenue derived from the  $\text{K}_2\text{O}$  that is recovered in the dust should yield profitable returns even if the price of the  $\text{K}_2\text{O}$  were to drop to a value of \$1.00 per unit.

W. H. ROSS.

**Future of the potash industry.** J. W. TURRENTINE. Summerland, Calif. *Chem. Met. Eng.* 20, 310–11 (1919).—A plea for scientific organization and coöperation in the development of American potash.

W. H. ROSS.

**The water hyacinth as a source of potash.** F. W. F. DAY. *Agr. Bull. Federated Malay States* 6, 309–14 (1918).—The variable results obtained in previous work (Finlow and McLean, *C. A.* 11, 3088) for the  $\text{K}_2\text{O}$  content of the water hyacinth is attributed to the presence of variable amts. of fine particles of silt, etc., which are incorporated in the roots, or otherwise adhere to the plant, and which may very greatly increase its apparent ash content. When freed from roots and extraneous matter the ash of the sun-dried plant should amount to about 15%, and contains approx. 25% of  $\text{K}_2\text{O}$  which gives about 3% as the  $\text{K}_2\text{O}$  content of the dried plant. The  $\text{K}_2\text{O}$  in the ash of samples consisting mostly of stalks is almost entirely water-sol., and is present principally as the chloride. In other samples yielding a higher % of ash, a portion of the  $\text{K}_2\text{O}$  was found to be insol. and is thought to be derived from feldspathic particles contained in the ash. The av. value found for the  $\text{P}_2\text{O}_5$  content of the ash amounted to 0.6%.

W. H. ROSS.

**The potassium salts industry in war time.** LOUIS BRANET. *Rev. gén. sci.* 29, 175–84 (1919).—B. discusses the uses of K salts in fertilizers and the effect of the war in developing new or little used sources of supply to counteract the disappearance of German salts from the market. Considerable detail is given regarding the locations of new mineral deposits, the extn. of K salts from sea and saline lake waters, the treatment of insol. rocks and minerals to obtain sol. K salts, the recovery of K from cement and blast furnace dust, and the processing of wood ashes, turnesol stems, banana scrapings, potato leaves, waste liquors from beat-sugar refineries and wool-scouring establishments, marine algae and other animal and vegetable substances for their K content.

ISMAR GINSBERG.

**Water-glass manufacture.** O. MAERTZ. *Chem. Ztg.* 42, 569–70, 582–3 (1918); *J. Soc. Chem. Ind.* 38, 72A.—In the manuf. of  $\text{Na}_2\text{SiO}_3$ ,  $\text{Na}_2\text{SO}_4$  is now generally used in place of  $\text{Na}_2\text{CO}_3$  on account of its lower price, although a greater wt. has to be used in addition to a quantity of coal as a reducing agent, while it has a more destructive action on the furnace walls than carbonate. The materials are used in the proportion of sand 100,  $\text{Na}_2\text{SO}_4$  75, and coal 8 parts. The finely ground mixt. is fused at about  $1500^\circ$  in a tank furnace constructed of firebrick, the bottom being cooled externally by air-ducts connected with the chimney. The furnace proper communicates with a second

compartment by means of a hole at a distance from the bottom  $\frac{1}{4}$  the depth of the charge. The fused glass falling to the bottom of the furnace, flows into the second compartment, which may be separately heated to keep the water-glass molten, and is thence discharged into an Fe vessel filled with water to cool it. The furnaces are fired with producer gas and may be worked on the recuperative or the regenerative system, the former being suitable for small plant with a daily output of 1500-5000 kg., while for larger installations, up to 20,000 kg. per day, the regenerative system is better. The solidified water-glass is broken up into fairly small particles, usually by means of hammers. (It is not now generally ground in a ball mill as the finely divided particles ball together during the extn. process and then only dissolve with difficulty.) The broken product is then transferred to the dissolving drums, in which it is treated with steam at about 5 atms. pressure, while the drums rotate at about 6 revolutions per min.; the soln. process takes about 6 hrs. The capacity of the drums should be in the proportion of 1 l. to 1 kg. of dissolved glass, so that, the sp. gr. of the water-glass being 1.5, the drum is  $\frac{2}{3}$  full at the end of the process. A convenient capacity is 6000 l. For each kg. of solid glass about 1.5-2 kg. of steam is used. When soln. is complete the product is run off into settling tanks and, after the mud has settled, passed through a filter-press. The clear water-glass so obtained generally has to be concd., this being carried out in a closed steam-jacketed vessel connected to a vacuum pump, the soln. being stirred during concn. to obtain a homogeneous product. Cf. C. A. 12, 1414. E. H.

**The phosphate production and resources of the world.** P. G. MORGAN. *J. Agr. (New Zealand)* 16, 76-82(1918); *Expt. Sta. Rec.* 39, 521.—This is a summarized discussion of available information obtained from various sources relative to the world's production and supply of phosphates. E. H.

**How the nitrogen problem has been solved.** HENRY JERMAIN MAUDE CRRINGTON. Swarthmore College. *J. Franklin Inst.* 187, 377-408(1919).—An elaborate account of the fixation of atm. N on a commercial scale as oxides in the arc processes, and as  $\text{NH}_3$  by direct combination with H. JOSEPH S. HERBURN.

**Novel method for treating sulfur ore.** K. THOMAS. *Chem. Met. Eng.* 20, 261 (1919).—A brief discussion of the attempts to develop and operate western S deposits, mostly of solfataric origin and not adapted to the Frasch process. There is promise of good results by flotation. One of the ideas evolved is based on the "shot-tower" principle. The S with the gang is submitted to treatment under pressure of superheated steam, with the result that the S is liquated and drains through the perforated bottom of the retort along with more or less of the fine gang and dirt, the sepn. of which from the liquid S is one of the problems of other liquation applications. In falling a short distance, not more than 10 ft., the S forms small spheres in a similar manner to the action of the streams of molten Pb in the shot tower, and at the bottom of the chamber there is accumulated a mixt. of these "shots" and the fine material. The S "shots" are very pure and free from dirt and fine rock. Their further sepn. is an easy matter. F. W. SMITHER.

**Furnace settings for caustic pots.** F. H. NICKLE. *Chem. Met. Eng.* 20, 261 (1919).—A note stating that the words "counter-current" should have been omitted in the original article (cf. C. A. 13, 637), the direction of travel being concurrent with the rotation of the liquor. F. W. SMITHER.

**Concentration of graphite ore.** G. D. DUB. *Mining Sci. Press* 18, 283-6(1919).—Four methods are used for the rough concn. of graphite ore, the skin flotation, the pneumatic, the log washer, and the oil froth flotation systems. The crude concentrate usually contains 40-60% graphitic C, the impurities consisting of quartz, mica, wood

fiber, etc. This concentrate is refined pneumatically to No. 1 flake after grinding in a pebble mill if necessary to detach the impurities from the C. The av. final products in Alabama are No. 1 flake contg. 87% C, No. 2 flake with 77%, and dust with 30% C. A ton of ore yields, respectively 19, 5 and 3 lbs. of these grades, the recovery totaling 42.56%.  
E. SCHRAMM.

**Production of hydrogen and water glass by the silicol process.** ANON. *Chem. Met. Eng.* 20, 289-90(1919).—An illustrated description of a British Admiralty H plant. The installation contains a vat provided with a stirring device for prepg. the NaOH soln. The lower part of the vat is fitted with a pipe provided with a valve and ending in a gas generator; the latter is fitted with a "planetary stirrer," and has at its top part a receiver containing the Si alloy (Fe-Si, Mn-Si, silico-spiegel). The receiver has a hopper-shaped base in which acts a distributor worked by a crank. The NaOH is put in the vat to the extent of  $1\frac{1}{2}$  to 2 times the wt. of NaOH to that of H<sub>2</sub>O and the stirrer started; the heat evolved raises the temp. of the soln. to 60 to 80°. The soln. is then led into the gas generator, which it should reach at a temp. sufficient to start the reaction on contact with the Si alloy. The "planetary stirrer" causes the Si alloy powder falling from the hopper-shaped base of the receiver to come into intimate contact with the NaOH soln., and prevents it from accumulating in the center of the generator. The H gas, evolved at a high temp., flows into a scrubber-condenser, where it loses H<sub>2</sub>O vapor and is cooled at the same time. The H gas then flows out through a pipe for utilization. The H<sub>2</sub>O used for cooling the gas in the scrubber-condenser, which leaves this at a temp. near the b. p., is recovered and utilized in the vat or gas generator. Where a weak NaOH soln. is used, a neutral Na silicate is formed; with a concd. soln., an acid silicate poorer in Na is obtained; this leads to a saving in NaOH and allows the obtaining of non-caustic residues which can be utilized for dyeing and bleaching. The products may be utilized in peace times for the hardening by hydrogenation of oils and in oil refining by the water glass method.  
F. W. SMITHER.

**The use of helium for aircraft purposes.** ANON. *Nature* 102, 487-8(1919).—A review of the principal steps that have been taken in Great Britain for the production of He for use in air ships and for other purposes.  
W. H. ROSS.

**Industrial value of the material of the national powder mills.** ANON. *l'Industrie chimique* 6, 51-2(1919).—A discussion of the ways in which various materials accumulated during the war may be utilized by the industries and by the State for the public welfare.  
F. W. SMITHER.

**Chemical war secrets and releasing manufacturers' rights.** EDWARD GUDEMAN. *Trans. Am. Electrochem. Soc.* 35 (preprint).—The attitude the government should now take towards valuable chem. information divulged to it by individuals and corporations during the progress of the war is discussed.  
H. JERMAIN CREIGHTON.

**Lubrication of air compressors.** H. V. CONRAD. *Eng. Mining J.* 107, 392-4 (1919); *Textile World J.* 55, 79(1919); *Sugar* 21, 125-7(1919).—In choosing a lubricant for air cylinders, the high temp. reached must be kept in mind. Faulty lubricants make trouble mainly by carbonizing. This interferes with valve action, causes undue friction, and may be a fire risk in case the oil is heated above its flash point. For paraffin base oils the following limits are set: Sp. gr. (Bé.) 25 to 32; open cup flash point, 375 to 500° F.; fire point, 425 to 575° F.; Saybolt viscosity, 120 to 1500 sec. For asphaltic base oils the corresponding limits are 19.5 to 22° Bé.; 305 to 375° F.; 360 to 440° F.; 175 to 750 sec. Vegetable or animal oils are to be avoided. Asphaltic base oils are more apt to carbonize, but asphaltic oils give a bulkier and less dense deposit. For a few hrs. once a week the air cylinder should be fed with a mixt. of 1 pt. soft soap to 15 pts. H<sub>2</sub>O, used at about 10 times the rate of oil feed, and kept up for several hrs.

to cut out the C. Air receivers and piping should have a 1:18 mixt. of NaOH and H<sub>2</sub>O injected occasionally to keep down deposits. Air cylinders should have from 1 drop oil per min. for an 8 × 8 cylinder to 12 drops for a 42 × 42 cylinder. Steam cylinders should have about 4 times as much. W. L. BADGER.

An investigation of stench and odors for industrial purposes. V. C. ALLISON AND S. H. KATZ. *J. Ind. Eng. Chem.* 11, 336-8(1919).—A detailed account of an investigation of the use of stench as a warning in mines. The authors have developed an app. or "odorometer," for measuring the intensity of odors in varying concns. in air. A table and curves are given showing the results obtained with 24 different chemicals. F. W. SMITHER.

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The cycle of oxidation of nitric oxide in presence of water (SANFOURCHE) 6. Points in pump selection (EVERETT) 1. Power needs of U. S. nitrate plants (WELLES, MITCHELL) 4. Synthesis of ammonia at high temperatures (MAXTED) 6.

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ROCKWOOD, NATHAN C.: Index to "Engineering News" for the Years 1910 to 1917 Inclusive. New York: McGraw-Hill Co. 469 pp. \$3 net or \$6 in combination with indexes for 1890-99, 1900-04, 1905-09. For review see *Eng. News-Record* 82, 779(1919).

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Concentrating sulfuric acid. A. B. NEWMAN. U. S. 1,294,525, Feb. 18. H<sub>2</sub>SO<sub>4</sub> to be concd., which may be of a strength of 60° B $\acute{e}$ ., is distd. and the distillate is introduced into the flue system from the roasting furnace to the Glover tower so that a sufficient amt. of heat is derived from the highly heated gases in the flue system to maintain the distillate above its temp. of condensation during its passage through the flue system. The distillate is recovered in the Glover tower or in the succeeding chambers.

Concentrating sulfuric acid. J. PATTEN. U. S. 1,294,827, Feb. 18. The acid to be concd. is fed into the first of a connected series of concentrators. This first concentrator is heated by first contact with hot furnace gases which then pass successively beneath the other concentrators of the series.

Hydrofluoric acid. R. M. CATLIN. U. S. 1,293,703, Feb. 11. HF is produced from solns. containing H<sub>2</sub>SiF<sub>6</sub> or other combinations of F and Si by adding Fe oxide to the soln., removing the ppt. formed, crystg. out Fe fluoride from the filtrate and then subjecting the Fe fluoride to the action of superheated steam to drive off HF. The latter is absorbed in H<sub>2</sub>O. The Fe oxide preferably is added to the soln. of H<sub>2</sub>SiF<sub>6</sub> at a temp. of about 93°.

Apparatus for condensing hydrofluoric acid. R. S. SHERWIN. U. S. 1,294,546, Feb. 18. The app. comprizes a first absorbing tower made of material, such as wood, which is resistant to the action of HF, containing baffles which break up and subdivide the liquid falling through the tower and which are spaced further apart in the lower than in the upper part of the tower, coolers for independently cooling the liquid flowing into and out of the tower, a second absorption tower and connections for withdrawing liquid from the latter to an open vessel, from which the liquid may be re-introduced into the second tower.

Alkali metal silicates from rice hulls. G. BLARDONE. U. S. 1,293,008, Feb. 4. Burned rice hulls 4-5, H<sub>2</sub>O 10 and NaOH 1 part are boiled together for a half hr. or longer and a soln. of Na silicate thus obtained is filtered and concd. by boiling. Na silicate may also be obtained by fusing together 3 or 4 parts of burned rice hulls and 1 part Na<sub>2</sub>CO<sub>3</sub> (or 8 or 10 parts of burned rice hulls and 3 parts Na<sub>2</sub>SO<sub>4</sub>) and extg. the product

with  $H_2O$ . Fresh or only partially burned rice hulls may be similarly treated and  $KOH$  or other K compds. may be used (instead of the Na compds.) to obtain K silicate.

**Sodium hydrogen carbonate and ammonium sulfate from sodium bisulfate.** G. N. VIS. U. S. 1,294,526, Feb. 18.  $NaHSO_4$  is dissolved in  $H_2O$  and the soln. is successively treated with  $NH_3$  and  $CO_2$  under slight pressure until satn. is complete, forming  $(NH_4)_2SO_4$  and  $NaHCO_3$ .

**Alkali metal cyanides.** F. J. MERTZGER. U. S. 1,295,049, Feb. 18. After production of cyanide by the action of N upon a mixt. formed of alkali metal carbonate and coke, charcoal or other carbonaceous material, the reaction product is treated with acetone or dil. alc. or other solvent which will dissolve alkali metal cyanide and hydroxide but in which alkali metal carbonates are relatively insol. and the soln. thus obtained is then treated with  $CO_2$  under slightly greater than atm. pressure to convert the hydroxide into carbonate (of decahydrate form) and cause the pptn. of the latter. The soln. is then filtered off from the ppt. and evapd. to recover the cyanide.

**Separating sodium nitrate from potassium nitrate.** G. C. GIVEN and R. H. BARTEAUX. U. S. 1,294,788, Feb. 18. A soln. containing nitrates of both Na and K is evapd. *in vacuo* at a temp. of about  $80-95^\circ$  until some  $NaNO_3$  is sepd. and the  $KNO_3$  is then sepd. from the concd. soln. remaining.

**Production of nitrates by means of bacteria.** CARL T. THORSSELL and H. R. LUNDEN. Can. 189,602, Apr. 15, 1919. A nutrient medium inoculated with nitrifying bacteria is treated with a material which is not injurious to the nitrifying bacteria and which is adapted to destroy bacteria which are injurious to the nitrifying bacteria and the product thus obtained is introduced into  $NH_3$  combinations to be oxidized.

**Production of nitrates by means of bacteria.** CARL T. THORSSELL, *et al.* Can. 189,600, Apr. 15, 1919. A liquid nutriment containing  $CaCO_3$ ,  $Ca(NO_3)_2$  and an  $NH_4$  salt is inoculated with nitrifying bacteria to effect oxidation and the formation of a liquid containing  $Ca(NO_3)_2$ . A portion of the liquid is withdrawn, treated with an  $NH_4$  salt and  $CaCO_3$  and again inoculated with the nitrifying bacteria.

**Catalytically active substances.** F. MÜLLER. Ger. 207,380, 1918. Werner's salts (*i. e.*, the double salts of the heavy metals and complex salts described by Werner, *Neuere Anschauungen auf dem Gebiete der organischen Chemie*, 1913) are heated with exclusion of air at a temp. not exceeding that at which the catalyst is intended to be used. Heating may occur in a current of N or in a vacuum; if the product is to be used as catalyst for reaction between gases, the heating may take place in an atm. of one or all of the gases. Previous to heating, the substance may be distributed over carriers, such as clay or asbestos. For reactions between liquids and gases, the heating may proceed in the liquid after the salt has been dissolved, suspended, or emulsified. In many cases, it is necessary to heat under pressure. A catalyst from K chromicyanide at  $300^\circ$  gave 15% of ammonia at  $300^\circ$  and 120 atm. Ammonia undergoes quant. combustion in the presence of the product from luteochromium ferricyanide at  $300^\circ$ .  $NH_4$  ferrimolybdate when heated at  $400^\circ$  in an atm. of N and H yields a loose, black powder which yields 19% of  $NH_3$  at 160 atm. and  $400^\circ$ .  $NH_4$  Na cobaltcyanide is converted by ignition at  $700^\circ$  in N into a very porous, black catalyst for the synthesis of  $NH_3$ . Carbonatopentamminocobalt nitrate is heated at  $420^\circ$  in a current of N and H for the prepn. of a catalyst. Up to 8% of formaldehyde could be obtained from  $CH_4$  and O at  $150^\circ$  by use of a catalyst from croceocobalt nitrate (heated in N at  $150^\circ$ ). The catalyst from nitratopurplecobalt nitrate is useful in the synthesis of  $NH_3$ . Indole is formed by hydrogenation of Me *o*-toluidine in the presence of the catalyst from hexaquochromi-acetate. Borneol is converted into camphor in the presence of a product from hexa-

quochromipropionate. A catalyst from Co hydroxynitrite brings about the quantitative oxidation of  $\text{SO}_2$  to *sulfur trioxide* by an excess of O.

**Zinc oxide and chloride.** S. SANDERS. Brit. 121,984, Nov. 27, 1917. Galvanizer's waste flux is broken up and boiled with  $\text{H}_2\text{O}$ ,  $\text{ZnO}$  being removed from the surface as a froth. The liquor is then allowed to settle, a little  $\text{CaO}$  being added if desired. The sediment is washed to sep. particles of metal, the other portion of the sediment being mixed with a binding agent such as a bleaching powder residue obtained in the treatment of the clear soln., and formed into *fireproof articles*. The settled soln. is clarified over a bed of bleaching powder and may be used for *fireproofing*.

**Production of alumina.** RALPH H. MCKEE. Can. 189,848, Apr. 22, 1919.  $\text{Al}_2\text{O}_3$  is removed from Al materials containing Fe and native basic sulfates of Al by dissolving the material in an acid solvent, fractionally removing Fe by electrolysis and then electrically pptg. the Al as hydroxide and simultaneously regenerating the acid solvent for reuse in the initial step.

**Regenerating mercury catalysts.** H. A. MORTON. U. S. 1,293,863, Feb. 11, 1919. Mercury catalysts (such as those which may have been used in making  $\text{AcH}$  from  $\text{C}_6\text{H}_6$ ) when exhausted are regenerated by treating with  $\text{Cl}$  to form  $\text{HgCl}_2$  and then sepg. the latter and converting it into the desired compd., e. g.,  $\text{HgSO}_4$ , for further catalytic use.

**Hydrogen peroxide.** DAVID LEVIN and L. L. MOLIN. Can. 189,193, Mar. 18, 1919. In the production of  $\text{H}_2\text{O}_2$  by film distn. of persulfates the soln. is sprayed over heated  $\text{H}_2\text{SO}_4$ -proof metallic surfaces on which an unbroken film is maintained by the rapid rate of flow of the liquid and the  $\text{H}_2\text{O}_2$  is condensed quickly enough to prevent dissociation.

**Methods of conducting high-temperature reactions.** N. TESTRUP. Can. 189,586, Apr. 8, 1919. The substance to be roasted is placed in a continuous layer on a conveyor which travels below and parallel with the level to which the walls of the heating chamber depend. The thickness of the layer is greater than the distance between the surface of the layer and the bottom level of the walls of the heating chamber so that the latter sweeps a recessed path for itself in the moving layer. App. is specified.

**Dental filling.** H. A. BLACK. U. S. 1,294,355, Feb. 11, 1919. A powdered mixt. for prepg. dental fillings is composed of nitrocellulose 100, gum amber (measured as a satd. soln. in  $\text{CHCl}_3$ , the  $\text{CHCl}_3$  being evapd. in the prepn. of the powder) 40 and powdered  $\text{SiO}_2$  25 parts. When this mixt. is to be used for filling cavities, it is made into a plastic mass by the addition of a solvent mixt. composed of acetone 2 parts and a satd. soln. of gum amber in  $\text{CHCl}_3$  1 part.

**Casein composition for imitations of porcelain.** M. PONTIO. U. S. 1,293,191, Feb. 4, 1919. A compn. for making doll heads or other molded articles is formed as follows: Casein 10 parts is dissolved in an aq. alk. soln., together with gelatin 10 and gum arabic 2.5 parts, mixed with a white mineral powder such as talc, plaster of paris, Spanish white or Meudon white, and the mixt. is molded and then hardened in a bath of  $\text{CH}_3\text{O}$  soln.

**Lubricant for treating transmission-bands.** C. J. JOHNSON. U. S. 1,293,107, Feb. 4, 1919. Fabric straps for use as transmission-bands are boiled in a mixt. of graphite 50, paraffin 45 and grease 5%, to render them pliable and non-hardening.

**Reclaiming printers' roller composition, etc.** T. H. GROZIER. Brit. 121,941, June 28, 1918. A process of sepg. the fusible from the infusible parts of old printer's roller compn. or analogous substances consists in treating the compn. by the direct action of low-pressure superheated steam in a closed vessel and intercepting and vaporizing the  $\text{H}_2\text{O}$  of condensation to prevent its admixt. with the recovered compn.

**Measuring pressure between bodies.** AKTIEBOLAGET SVENSKA KULLAGER, FABRIKEN. Brit. 121,946, Dec. 19, 1918. The pressure between bodies in contact, which bears a definite relation to the deformation produced, is detd. by etching the portions around the surface of contact while under pressure and deducing the pressure from measurements of the unaffected parts. An etching liquid for Fe and steel bodies is prepd. in the following manner.  $MgCl_2$  is dissolved in boiling  $H_2O$  and  $CuCl_2$  is added. The combination is stirred into a soln. of  $BiCl_3$  in  $HCl$ , and alc. is added. Proportions of these substances are set out in the specification.  $Cl$  gas may be used for the same purpose.

## 19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

**Strength tests of plain and protective sheet glass.** T. L. SORBY. *J. Am. Ceram. Soc.* 1, 801-8(1918).—*Rifle Tests:* Plate glass  $1/8"$ ,  $3/16"$  and  $1/4"$  thick and blown brown glass  $3/16"$  thick were tested (a) in original condition and (b) with a sheet of celluloid firmly attached to the back. Shots from army rifle were fired at 50 ft. All plain samples (a) shattered badly while samples (b) showed fairly clean cut holes. In *impact testing* by a pendulum method it was shown that the first crack appeared about as soon in the coated as in the uncoated samples but the coated glass shattered less. In *cross-breaking tests* the coated glass was about 15% weaker than plain glass when the coated side was in compression and about 40% stronger when the coated side was in tension. In both impact and cross-breaking tests blown glass was stronger than polished plate glass.

C. H. KERR.

**Some incidental notes of a flint-glass works manager from 1875 to 1916.** HARRY J. POWELL. *J. Soc. Glass Tech.* 2, 241-6(1918).—A partial history of Whitefriars Glass Works, London. Expts. with "toughened" glass were started by de la Bastie in 1875. Pot stones were identified in 1876. Pyrometers were successfully used in 1876. Good X-ray tubes were made in 1896. Expts. on thermometer glass were started in 1897. Anticataract spectacle glass, cutting out infra-red and ultraviolet rays, was made for Sir Wm. Crookes in 1911. The notes are most interesting. C. H. KERR.

**Cherry-red glass direct from the pot.** ANON. *Spektsaal* 50, 126(1917); *J. Soc. Glass Tech.* (Abstracts) 2, No. 5, 9(1918).—A formula is given for a mix to be fused, ground and re-fused with addition of Pb glass or cullet. The color is intensified by annealing.

R. K. HURSH.

**Opal glasses from cryolite or cryolite substitutes.** *Spektsaal* 50, 125(1917); *J. Glass Tech.* (Abstracts) 2, No. 5, 8-9(1918).

R. K. H.

**Barium carbonate as a constituent of a glass batch.** ANON. *Spektsaal* 50, 148(1917); *J. Soc. Glass Tech.* (Abstracts) 2, No. 5, 9(1918).

R. K. H.

**Glass-house pots for sheet glass.** *Spektsaal* 50, 125(1917); *J. Soc. Glass Tech.* (Abstracts) 2, No. 5, 10(1918).—A discussion of pot mixts. The ratio of plastic to burned clay should not be less than 5 to 6.

R. K. HURSH.

**Open glass-house pots for melting sheet glass.** *Spektsaal* 50, 270(1917); *J. Soc. Glass Tech.* (Abstracts) 2, No. 5, 10(1918).—A discussion of the proper dimensions of pots.

R. K. HURSH.

**Etching solutions without hydrofluoric acid.** ANON. *Spektsaal* 50, 251(1917); *J. Soc. Glass Tech.* (Abstracts) 2, No. 5, 20-1(1918).—Fluorides, sulfate and  $HCl$  or  $H_2SO_4$  are recommended.

R. H. KURSH.

**Refractory materials and the glass industry.** J. W. COBB. *J. Soc. Glass Tech.* 2, 262-70(1918).—An excellent general review. C. H. KERR.

**Glasses for protecting the eyes from injurious radiations.** W. W. COBLENTZ AND W. B. EMERSON. Bur. of Standards, *Tech. Paper* 93, 25 pp.(1919).—This paper is published with the object of supplying the general characteristics of certain newly developed glasses sometimes used for protecting the eye from radiant energy, especially the infra-red rays. An appendix gives transmission data of various glasses obtained in collaboration with M. B. Long. E. J. C.

**Notes on the welding of glasses.** LEON APPERT. *Bull. soc. encour. ind. nat.* 131, 67-91(1919).—A. reviews in general terms the welding of glasses and the enameling of metals. The most important factors are coeff. of expansion, permeability to heat and absence of reactions or alterations during welding. These points are discussed at length. Enamel coats to be most serviceable should be built up of many thin coats successively applied. C. H. KERR.

**The relative action of acids on enamels.** E. P. POSTE. *J. Am. Ceram. Soc.* 2, 32-43(1919).—The dil. acids are more active than the concd., the max. being about 20%. Acetic acid shows unexplained irregularities at about its max. activity and this plus the varying strength as usually sold make it undesirable as a standard testing acid. Citric and tartaric acids are more active than acetic. Above 10 up to 50% both show practically horizontal straight line curves of solvent action so that small errors in concn. are of small importance. Tartaric is more stable than citric acid but either would be satisfactory as standard acid. C. H. KERR.

**Refractory materials as a field for research.** EDWARD W. WASHBURN. *J. Am. Ceram. Soc.* 2, 3-31(1919).—An hypothetical research association or corporation for the entire industry is outlined and the general nature of problems and correlation with other organizations is discussed. The fundamental problems of refractories are outlined. C. H. KERR.

**Fusibility of graphite ash and its influence on the refractoriness of bond clay.** M. C. BOOZE. *J. Am. Ceram. Soc.* 2, 65-8(1919).—Softening point of graphite ash is not a true index of its action in a crucible. Any lowering of refractoriness of a crucible due to graphite ash is not evident at brass-melting temps. and would seldom be detrimental even in steel-melting crucibles. The ash from Alabama graphite is less active as a flux than ashes of Ceylon, Canadian, Pa., or N. Y. graphites. C. H. KERR.

**Some apparatus used in the laboratory control of the manufacture of silica brick.** H. LECHATLIER AND B. BOGITCH. *Rev. metal* 15, 511-31(1918).—The most important properties are (1) chem. compn., (2) density, (3) crushing strength, cold, (4) expansion and crushing strength at 1600°. Method for ultimate analysis is given. Best quality bricks contain about 1% each CaO, Al<sub>2</sub>O<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub> with 97% SiO<sub>2</sub>. To stand in the arch of a steel furnace at 1700° the SiO<sub>2</sub> content should be over 95% and preferably 97%. The d. of good bricks should be from 2.30 to 2.40. A form of cement sp. gr. bottle is described for use on SiO<sub>2</sub> and details are given. Good crushing strength when cold is important; 100 kg. sq. cm. is a safe min. while excellent bricks show 200-300 kg. Failure of bricks in a steel furnace is due chiefly to (1) expansion and consequent disruption and (2) partial fusion. Lab. testing furnaces are described in detail, especially a recuperative furnace. C. H. KERR.

**Clays for paper making (ROE) 23. Relative volatilities of refractory materials (MOTT) 4. System CaO-MgO-SiO<sub>2</sub> (FERGUSON, MERWIN) 6.**

**Packing glass.** E. B. BROGLEY. U. S. 1,293,684, Feb. 11. Before packing



glass in straw for shipment, the glass is coated with a mixt. formed of  $H_2SO_4$  1, lubricating oil 1 and  $H_2O$  128 parts to prevent discoloration of the glass by the decompn. products of the straw.

**Glass-making apparatus.** T. J. MCCOV. Can. 187,944. Dec. 17, 1918. Structural features.

**Magnesite refractories.** ROBERT D. PIKE. Can. 189,142, Mar. 18, 1919. A metallic deoxidizer such as a ferro alloy is mixed with magnesite and the mixt. is heated to cause the alloy to react with the magnesite. If necessary,  $Fe_2O_3$  may be added to the mixt. When water is added the product may be molded into any desired shape.

**Refractory composition.** H. M. OLSON. Can. 189,135, Mar. 18, 1919. The material consists of finely divided infusorial earth,  $Na_2SO_4$ ,  $Al_2(SO_4)_3$  and  $CaO$ .

**Refractory articles.** F. J. TONE. Can. 189,191, Mar. 18, 1919. A refractory containing fireclay and less than 60%  $SiC$  which is largely retained on a 60-mesh screen, is used for making saggars which have little or no deleterious influence on the ware brought into contact with them. With the proportions used the  $SiC$  crystals are surrounded by a film of clay which prevents action of the  $SiC$  on the white pottery ware.

## 20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

**Double salts of calcium and potassium and their occurrence in leaching cement mill flue dust.** E. ANDERSON. *J. Ind. Eng. Chem.* 11, 327-32(1919).—A. gives a résumé of previous researches on the double salts of K and Ca, *vis.*, potassium mono-, di-, and penta-calcium sulfates. References are given to original articles. Equil. conditions with reference to temp. and concn. are discussed and shown in drawings for  $K_2SO_4$ , syngenite or K mono-Ca sulfate, K penta-Ca sulfate and gypsum. A. finds that the reactions involved in the formation of these double salts are slow, especially in the presence of chlorides. His conclusion regarding the formation of these double salts in the leaching of cement mill flue dust is shown in the following: "Continuous operations have been carried on with practically satd. potash solns., where the time of contact averaged 1 hr., with no sign whatever, either visual or analytical, of the formation of any of the double salts referred to. From the above it will be seen that during the leaching of cement-mill flue dust for the recovery of potash, the operation may be so adjusted as regards time of contact and soln. concn. that the formation of double salts can be avoided at whatever temp. is chosen as being the most desirable for the leaching operation."

O. E. H.

**Compressive strength of cement-lime mortars.** F. A. KIRKPATRICK AND W. B. ORANGE. *J. Am. Ceram. Soc.* 2, 44-64(1919).—Tests were made with one kind only of lime, cement and sand. Hydrated lime added to portland cement mortars in moderate amts. increases d. and strength. Like amts. of cement added to the same mortars cause equal or greater strength increases.

C. H. KERR.

System  $CaO-MgO-SiO_2$  (FERGUSON, MERWIN) 6.

**Treating cements.** W. E. WINDSOR-RICHARDS. Brit. 121,986, Dec. 4, 1917. Clay, preferably dried and powdered, is mixed with ground portland or like cement to form a molding compn. The clay may be china clay, ball clay, or ordinary clay or fireclay. The mixt. may contain asbestos or other fiber. An example is: Portland

cement 30, waste asbestos fiber 15, clay 10. Articles molded from the compn. may be impregnated with a bituminous liquid as described in 3,364, 1915 (C. A. 10, 2137).

**Staining marble.** M. L. McDONOUGH. U. S. 1,293,832, Feb. 11. Marble is heated with steam and is then stained by the use of a soln. prepd. from coal oil, alc. and an aniline dye.

## 21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

**Deterioration in the heating value of coal during storage.** G. CECIL JONES. *J. Soc. Chem. Ind.* 38, 58-9R(1919).—A criticism of the conclusions drawn by Porter and Oritz (C. A. 12, 217). J. calls attention to the necessity of weighing the bulks of coal before and after storage, in order accurately to measure the deterioration. The deterioration measured by P. and O. was only that resulting from the fixation of oxygen, no account being taken of possible loss of coal substance in volatile form. That there was such loss is shown by the increase in % ash upon storage. J. summarizes results from several tables given by P. and O. and adds a column of mean values, from which he draws his conclusions. The results all refer to New River (West Virginia) coal. Even after due allowance is made for sampling and experimental errors, the figures show that the % ash in the coals has increased upon storage, the increase being from 6.8 to 7.5 during the first year, and thereafter at a gradually diminishing rate. If foreign inorg. dust did not gain entrance to the coal heaps, it would appear that about 0.1 the original coal substance had disappeared with the first year, and not much less in the second. The total loss on storage may have been several times as great as P. and O. conclude. J. thinks further expts. are required.

A. G. BLAKELEY.

**Sampling and analyzing coal.** CHARLES BENTLEY. *Pahasapa Quarterly* 8, 55-60(1919).—A brief description of mine sampling and of the usual well-known methods of proximate analysis and heating value detn.

A. G. BLAKELEY.

**Fusibility of coal ash.** W. A. SELVIG, W. C. RATLIFF AND A. C. FIELDNER. *Chem. Met. Eng.* 20, 274-6(1919).—Fusibility tests of ashes of coals from the interior province (including Illinois, Indiana, Kentucky, Missouri, Oklahoma, Arkansas and Texas) are summarized and compared with tests of ashes from West Virginia coals. The tests were made by the gas furnace method (cf. C. A. 13, 372), the ashes being heated in a reducing atm. by which the Fe in the ash was reduced to the ferrous state. This method gives the lowest temp. at which clinkering may result; and this is of special importance in testing ash from coals of the interior province, as these coals contain a relatively large amt. of Fe as pyrite. Analyses of clinkers from boiler furnaces indicated that the conditions were such as to form clinkers in which the Fe is principally ferrous. The tables given include av. values for softening temp., and % ash and S in the dry coals. The point taken as the softening temp. is that at which the ash when molded into solid triangular pyramids 0.75 in. by 0.25 in. wide at the base, and mounted in a vertical position, has fused down to a spherical lump. The softening temp. of coal ash from the various coal fields of the United States ranges from 1900 to 3100° F. The authors subdivide this range into classes: I, refractory ashes, softening above 2600° F.; II, ashes of medium fusibility, softening from 2200 to 2600° F.; III, easily fusible ashes, softening below 2200° F. The W. Va. coals include representatives of all three classes. Ashes of some W. Va. coals did not fuse at 2830° F. in the gas furnace and were heated to 3010° F. in a Mo wire resistance furnace in an atm. of H. Ashes softening above 2830° F. have such a low Fe oxide content that the nature of the atm. surrounding the ash cone has little influence on the fusibility. Ashes from many W.

Va. coals remained unfused at  $3010^{\circ}\text{F}$ . In the case of the province coals, with few exceptions, the av. fusibility values of the different beds are between  $1900$  and  $2200^{\circ}\text{F}$ . The values for different samples in the same mine usually show comparatively small variation, averaging  $140^{\circ}\text{F}$ . The low softening temp. of the ash from the interior province coals is probably due to the pyrite, gypsum, and calcite that occur so generally as impurities in these coals. Individual mines producing lower-S coal than the av. S values given for the bed in which they occur also gave higher fusibility of ash values than that indicated in the table for the bed.

A. G. BLAKELEY.

**Excessive ash in coal.** J. G. WHITE. *Elec. Rly. J.* 52, 504(1918); *Science Abstracts* 21A, 427.—A brief summary of a study made by the J. G. White Engineering Corporation for the U. S. National Research Council of the losses due to high % of ash content in coal. Two charts show the effect of varying % of ash on: (1) heat available for useful work, and (2) coal consumption per boiler horse-power.

E. J. C.

**Western coal.** R. D. MACLAURIN. *Can. Chem. J.* 3, 124-5(1919).—An argument for the use in Western Canada, for domestic purposes, of the Alberta anthracite and especially the bituminous coal and raw lignite instead of imported Pennsylvania anthracite or the proposed manufactured lignite briquets. Lignite, raw, dried, or carbonized, can be burned in a suitable furnace as readily as anthracite; and can be burned without soot, smoke, or danger of explosion. Attention is called to 20-5% waste of fuel due to inefficient methods of combustion.

A. G. BLAKELEY.

**Use of pulverized coal at the Bunker Hill and Sullivan smelting and refining plant.** C. T. RICE. *Eng. Mining J.* 106, 91-4(1918).—An illustrated description of the Holbeck return system for the use of pulverized coal, and the particular application of the method at the Bunker Hill and Sullivan works (Pb smelter), where it is used for boilers, furnaces, and kettles.

F. W. SMITHER.

**Processes of briquetting lignite.** C. DUVAL. *Rev. prod. chim.* 21, 374-6(1918).—A review under the captions: (1) by drying and compression; (2) partial carbonization and compression; (3) by the addition of an agglomerant (various organic and inorganic materials).

F. W. SMITHER.

**Acetylene as fuel for automobiles.** H. GROSSMANN. *Schweiz. Bauzeitung*, Oct. 5, 1918; *Engineering* 106, 469(1918).—The utilization of  $\text{C}_2\text{H}_2$  is of particular importance for Switzerland owing to its manuf. by the aid of hydro-elec. power. The chief difficulties of using  $\text{C}_2\text{H}_2$  fuel in internal-combustion engines are that the compressed  $\text{C}_2\text{H}_2$ -air mixts. are themselves violently explosive, and that the soot and possibly acids produced by the combustion may corrode the motor. The first 2 difficulties can be overcome by diluting the  $\text{C}_2\text{H}_2$  with suitable gases or vapors; the soot deposition can be avoided by providing an ample supply of air. Air might be regarded as the simplest diluent to mitigate the violence of the explosion; G. found, however, that the combustion of air- $\text{C}_2\text{H}_2$  mixts. was always too sudden. The  $\text{C}_2\text{H}_2$  can be generated on board, or it can be taken from steel cylinders containing compressed  $\text{C}_2\text{H}_2$ , dissolved in acetone or in acetone substitutes. Such dissolved  $\text{C}_2\text{H}_2$  is relatively safer than gaseous  $\text{C}_2\text{H}_2$ , (cf. C. A. 12, 1345, 1829). From the cylinder a 2-mm. steel or brass tube is taken to the reducing valve which is connected to the carburetor; no additional app. are required, and the car is always ready for starting and can go on until the cylinder is practically emptied. The disadvantages are that the cylinders are heavy and expensive, and not generally obtainable. Journeys of thousands of km. were made with dissolved  $\text{C}_2\text{H}_2$ , the large cylinders giving a range of 120 km. As regards the generation of  $\text{C}_2\text{H}_2$  from  $\text{CaC}_2$  on the car, although there are hundreds of generators none of those tested by G. proved quite suitable as the  $\text{C}_2\text{H}_2$  has to be purified; the cylinder gas is always pure. The army authorities stipulated that the use of  $\text{C}_2\text{H}_2$  should not involve

any change in the mechanism, and that the machinery should at once be ready for either fuel,  $C_2H_2$  or petrol. Since the  $C_2H_2$  had to be diluted, one complication is unavoidable, whether  $C_2H_2$  gas or dissolved  $C_2H_2$  is to be used; for this purpose an additional tank is provided, and further a set of nozzles by means of which the diluent can be proportioned. A number of diluents appeared serviceable (alc., benzine, petrol, light tar oils, naphthalene,  $H_2O$ , etc.) and at least 20 or 25% of these were required to make the combustion less explosive. In a Martini car of 12 to 16 h. p. the change-over to the  $C_2H_2$  mixt. was effected by substituting a nozzle of 0.50 mm. for the 0.85 mm. nozzle. The % varies with the nature of the diluent; but an experienced driver can soon adjust his motor to the new conditions. Most of the diluents could be used as such; naphthalene and  $H_2O$  required preheating of the carburetor. A mixt. of  $C_2H_2$  with 20% of a mixt. in equal parts of alc. and light tar oil burned very well. Corrosion of the motor was not noted after 2 runs each of 1000 km. (motor fed with dissolved  $C_2H_2$ ). A motor boat was kept running for 6 to 8 hrs. per day for 1 month, the motor was found in good condition, although the  $C_2H_2$  was generated in a common Tozzi app. and not especially purified. The motors did not run hot, except in one case when half of the radiator was covered by an Fe plate. The consumption of lubricant remained normal. As regards fuel consumption, the tests indicate 1 kg. of  $C_2H_2$  is equiv. to about 2.5 kg. of benzine.

F. W. SMYTHES.

Curious coke-heated boiler failure. STROMEYER. *Gas J.* 145, 395(1919).—A coke-fired Galloway boiler developed a peculiar case of external uniform corrosion. On examn. the shell plates were found to be very thin and covered with a scale of dehydrated  $FeSO_4$  and  $Fe_2O_4$ . It was thought that the  $Fe_2O_4$ , being originally in the paint with which the boiler was painted and acting as a catalyst, had converted the  $SO_2$  from the furnace gases into  $SO_3$  which was absorbed by the scale on the boiler plates. It is assumed that when the boiler was lying idle and was cold, the hygroscopic calcined  $FeSO_4$  absorbed from the air enough  $H_2O$  to form with the  $SO_3$  a dilute  $H_2SO_4$ , which in turn acted on the iron and formed continually more  $FeSO_4$  crystals. The suggestion, therefore, is that the elements of  $H_2SO_4$  were formed while the boiler was at work but that the actual corrosion took place only when the boiler was idle.

J. L. WILEY.

Present and future of gas: Possibilities of carbonization of all coal at low temperatures. S. W. PARR. *Gas J.* 145, 388-9(1919); *Am. Gas Eng. J.* 110, 66-9(1919).

J. L. W.

Davis "Revergen" principle of firing furnaces with Town's gas. ANON. *Gas World* 70, 189-90(1919); *Gas J.* 145, 385-7(1919).—The "Revergen" principle is described as a "system of town's gas furnace firing by means of which heat losses by way of the furnace flue are reduced to an insignificant minimum and the thermal energy thus recovered utilized almost exclusively for the practical purpose of the furnace." The principle is one of "reversible regeneration" by means of which the air is heated on its way to the furnace. The gas and air, the latter at a pressure of a few inches water gage, are introduced separately each under the individual control of a main supply valve, and provided with means for accurate adjustment. Double recuperators, built under the oven, are of the exact capacity to extract the max. amt. of heat from the escaping gases and transfer it to the incoming air. Owing to the scarcity of essential highly refractory materials for construction of furnaces, the possibilities have not been fully exploited, although temps. of  $2000^\circ$  have been attained. One furnace with gas flow rates of 370, 600, and 800 cu. ft. per hr. recorded, resp., oven temps. of 1050, 1300,  $1360^\circ$  and gas flue temps. of 65, 105,  $182^\circ$ . A special test on a "Revergen" furnace and one of the best types of competitive furnaces was made. The test required that the oven be brought to  $820^\circ$  and loaded with billets, the whole being then brought back to the same temp. and maintained for 1 hr. The gas consumption per lb. of charge

for raising the temp. to  $820^{\circ}$  in the "Revergen" was 1.3 cu. ft., efficiency gain 48%; in the competitive furnace 2.5 cu. ft., efficiency loss 92.3%; maintaining the charge at  $820^{\circ}$  in the former for 1 hr. was 0.341 cu. ft. or 36% gain; in the latter 0.534 cu. ft. or 56% loss. Inclusive calcn. per ton of billets heated showed an efficiency gain of 46% for the "Revergen" and 84% loss for the competitive furnace. In computing the % of loss, the "Revergen" consumption figure was taken at 100, and the same value given to the competitive consumption in arriving at the % of gain in favor of the "Revergen." Several of these furnaces are in daily use and show fuel economies varying from 33 to 50% as compared with former costs.

*Iron Coal Trades Review* 98, 323(1919).—Further tests of the "Revergen" furnace with a  $54 \times 32 \times 24$  inch furnace: (1) 985 lbs. billets were charged into the furnace and heated to and kept at  $1000^{\circ}$ ; the time taken was 1 hr. 15 min. and the gas consumed per lb. of charge 1.421 cu. ft.; (2) 980 lbs. under similar conditions of time and temp. consumed 1.6 cu. ft. of gas per lb.; (3) 987 lbs. under same conditions consumed 1.59 cu. ft. of gas per lb. The billets when drawn had a temp. of  $1020$  to  $1025^{\circ}$ ; the av. exhaust gas temp. was  $180^{\circ}$  F. and at no time was that temp. in excess of  $200^{\circ}$  F. The av. calorific value of the gas used was 463 B. t. u. J. L. WILEY.

**New design of vertical retorts: The central system.** ANON. *Gas J.* 145, 455-6 (1919).—The system is of the semi-continuous, regenerative type and employs a minimum of labor, all operation being centrally controlled. It is compact in structure, the retort house being of octagonal shape, the alternate sides having 4 retorts, the triangular spaces between the retorts containing the producers and regenerators. Each bed of retorts is connected by a sep. flue to a central chimney and is separately controlled. The charging is done by means of a radial chute extending from the center and revolving on a track over the top of the hoppers. It is claimed to be a decided improvement over existing types for convenience and celerity of operations. J. L. WILEY.

**Improvements in carbonizing apparatus.** NORTON H. HUMPHREYS. *Gas J.* 145, 321-2(1919).—The objects of the inventions described are the prevention or the diminution of the formation or accumulation of carbonaceous or viscid deposits in the retort or the outlet therefrom; improved results both as to quantity and quality of the products; a combination of the advantages peculiar to the dry main and hydraulic main; and facilitation of the working of twin or coupled retorts. These results are accomplished by dividing the hydraulic main into compartments, one for each ascension pipe, and flooding any or all of these compartments whenever a seal is desired or for the purpose of washing out accumulations of pitchy matter. Means are also provided for reducing oscillation of pressure when working under seal. J. L. WILEY.

**Secondary reactions of oxide of iron purification.** G. WEYMAN. *Gas J.* 145, 322-3(1919).—The effect of the decompn. of steam by the S vapor under the high temp. developed is shown by the equation  $2S + 2H_2O = H_2S + SO_2$ . To prevent this reaction in the oxide purifier, the temp. of the last box should be kept fairly low, and no extra steam admitted. J. L. WILEY.

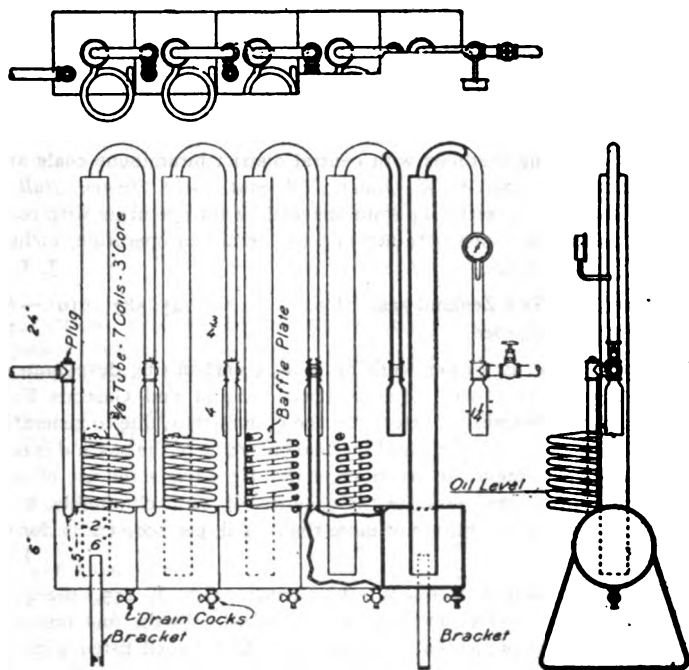
**Low-temperature carbonization in relation to the production of motor spirit, fuel oils, smokeless fuel and power gas: its aims and objectives.** F. D. MARSHALL. *Gas J.* 145, 383-5, 451-4(1919).—M. proposes to reduce the abnormal waste in utilizing fuel by subjecting it to the following cycle of operations: (1) Carbonization of the raw coal at a low temp. and recovery of the liquid products and a portion of the  $NH_3$ ; (2) gasification of the resultant coke into producer gas with recovery of the bulk of the  $NH_3$ ; each ton of coke will yield 120,000-140,000 cu. ft. of gas with a calorific value of 120-130 B. t. u. per cu. ft.; (3) conversion of the power gas into electricity; 110 cu. ft. of 130 B. t. u. gas will develop in good engines 1 kw. hr., and if for raising steam, 200

cu. ft. will develop 1 kw. hr. in efficient steam turbines. An av. coal when submitted to a high temp. in the retorts of 2000–2200° F. will yield approx. per ton: gas 12,000–13,000 cu. ft. of approx. 500 B. t. u., coke 66%, tar 9–10 gals.,  $(\text{NH}_4)_2\text{SO}_4$  20–28 lbs.; to a low temp. of 900–1200° F.: gas 4000–6000 cu. ft. of approx. 650 B. t. u., coke 70–75%, tar oils 18–22 gals., sulfate 15–22 lbs. Solid, compact and transportable low-temp. coke can be produced by confining the coal in comparatively narrow chambers with walls sufficiently strong to withstand the pressure of expansion of the coke. Under the low temp., a swelling coke will reach its max. of expansion in about 3.5 hrs. and will then shrink to allow of easy discharge. Such coke will also contain a residue of 9–12% of volatile matter which makes it easily ignitable and satisfactory for fuel. Its calorific value compared with good coal is 13,300 B. t. u., coal being 14,200 B. t. u. Low-temp. gas varies in thermal value from 550 to 650 B. t. u. before washing, after washing 400–450 B. t. u. Low-temp. carbonization of an ordinary bituminous coal gave results per ton as follows: Coke 75% containing 9% inflammable gas, very hard and dense; crude oils, water free 22 gals, sp. gr. 1.06; ammoniacal liquor, 9.5%; motor spirit, 3.94 gals.; pitch, 23%; ash in coke, 10.3%. Cannel coal gave results as follows: Coke, 70%, poor for domestic purposes but good for producer gas; ash in coke, 20.4%; crude oils, 53.5 gals.; ammoniacal liquor, 0.5%; pitch, 29%; motor spirit, 8.75 gals. The process described is the Tozer process, originally devised by the Tarless Fuel Syndicate. It consists in distributing the coal in thin layers in the form of a circle in such a way that a charge of 20–25 cwt. of coal can be carbonized in 4.5 hrs. The retort is constructed with 2 annular sections, one disposed concentrically within the other, the exterior heat being conducted through the first annulus of coal to the second by ribs which divide the annuli into vertical cells, advantage being taken of the conductivity of the cast iron of which the retort is built. The inner tube formed by the surrounding annuli is not filled with coal, but acts as a gas passage connecting the upper and lower ends of the retort. The retort will deal with practically every kind of carbonaceous material, caking and non-caking coals, shales, lignites and peat, in every physical condition from 3-in. down to dust, and will carbonize and produce coke from colliery slack and washings. The retorts are heated by a specially designed recuperative setting.

J. L. WILEY.

**Determination of gasoline in gas.** W. P. DYKEMA AND R. O. NEAL. *Chem. Eng.* 27, 5–7(1919).—The only accurate method of detg. the gasoline content of gases that contain less than a gal. of gasoline per 1000 cu. ft., is to allow a given quantity of the gas to come into contact with some absorption medium and to sep. the absorbed gasoline by distn. The app. (see fig.) consists of a piece of 6-in. casing with 5 sep. compartments, each of which is connected with  $\frac{3}{8}$ -in. gas inlet and also with a 2-in. gas discharge pipe or sep. chamber which extends to a point near the bottom of the casing. From the casing runs a  $\frac{3}{8}$ -in. pipe coiled around a 3-in. core with 7 turns, through which the gas being treated bubbles and in which most of the absorption takes place. There are valves at each extremity of the app. in order that gas may not be introduced too rapidly or may be throttled to any desired pressure so as not to carry oil over from one compartment to the next, also the use of a needle valve on discharge end to enable one to regulate more easily the rate of flow through the meter, especially in tests at low pressures, *i. e.*, when the gas flows through the absorber very slowly. It is advantageous to use gate valves instead of drain cocks for drawing off treated absorption oil from the oil chambers, as such valves facilitate rapid work and eliminate the possibility of volatilization losses when oil is allowed to spray through a stopcock under pressure, into the container for collecting treated oil. Also, time can be saved by using small bull-plugged nipples, in place of standard plugs, as they can be more easily removed and more rigidly connected to prevent leaks. To make the test, 2700 cc. of mineral Seal

Oil, or enough to bring the level of the oil about 2 in. above the top of the 6-in. casing and well above the coil inlet, is accurately measured and introduced into each compartment. The most important requisite for absorption media is high initial b. p. In most tests only the first 3 absorbers are used but it may be expedient to fill the 4th compartment when examining rich gases at low pressures or when running a large vol. of dry gas. The 5th division serves as an oil trap. A meter capable of measuring from 1 to 1000 cu. ft. of gas accurately is connected to the discharge of the absorber. The gas entering the absorber bubbles up through the oil, the latter absorbing the gasoline. After the desired amt. of gas has passed through the absorber the supply is shut off and the pressure is released, through the needle discharge valve, allowing all the gas to flow through the meter. After the pressure has decreased to atm. pressure, all of the oil is withdrawn at the bottom of the casing and the oil from each compartment is accurately measured, 1000 cc. of treated oil from each compartment being kept for distn.



Introduce 400 cc. of the treated oil into a 500-cc. Engler distilling flask connected to a condenser made of  $\frac{1}{2}$ -in. brass tubing and surrounded by ice  $H_2O$  contained in a metal box. The flask is heated by direct fire, slowly at first, and the gasoline is collected in a graduated cylinder. The flask is heated until the vapor reaches a temp. of  $177^\circ$  (usually requires about 20 min.). If the oil has a very high satn., let cool to 20 or  $30^\circ$  and again raise to  $177^\circ$ . This procedure is followed until practically no more gasoline is driven over and collected from the condenser. From the gasoline recovered from 400 cc. of oil from each compartment, calculate the vol. of gasoline in the total vol. of oil as measured. Gasoline content of the gas is calcd. by the formula  $G = (1000/V)(C/3785)$ , where  $G$  = gasoline content in gals. per 1000 cu. ft. of gas,  $V$  = the vol. in cu. ft. of gas treated, and  $C$  = the total no. of cc. of gasoline obtained from the treated absorption medium. The extn. of gasoline by the oil will depend upon the rate

of flow, gasoline content of the gas, vol. of gas treated, pressure, and the temp. of the absorbing oil. Optimum conditions as regards vols. of gas and rate of flow with gases at different pressures and gasoline content are given in a table. Data are given from tests made at a compression plant.

F. W. SMITHER.

**Experiments with bituminous coal in the manufacture of water gas.** R. G. KRUMREY. *Am. Gas Eng. J.* 110, 291-2(1919); *Gas Record* 15, 217-220(1919).—Operation of water-gas plant at Beloit, Wis., with coal is described. Av. operating results for 1 yr. with coke and coal, resp., are: cu. ft. of air per min. per sq. ft. of grate 150 and 100, cu. ft. of air per 1000 cu. ft. of gas 1490 and 1155, blast pressure 18 to 20 and 16 to 24 inches, steam per min. per sq. ft. of grate up run 1.75 and 2.06 lb., down run 2.15 and 2.3 lb., steam per 1000 cu. ft. gas 33 and 42.5 lb., av. running time 11 and 18 hrs., cu. ft. gas made per run per sq. ft. grate 288 and 228, gas per hr. per sq. ft. grate 2016 and 1596, generator fuel per 1000 cu. ft. gas 36.7 and 45.9 lb., oil used per 1000 cu. ft. gas 3.58 and 3.28 gal., B. t. u. 600 and 600. The saving in cost of coal over coke operation was \$0.116 per 1000 cu. ft. of gas made. During the last month certain slight changes in air and steam consumption were made by which the make was increased 140 cu. ft. and the oil and fuel were decreased, resp., 0.06 gal. and 2.5 lb. per 1000 cu. ft. of gas.

J. L. WILBY.

**Water-gas operating methods with central district bituminous coals as generator fuel.** W. A. DUNKLEY AND W. W. ODELL. Ill. State Geol. Survey, *Bull.* 24, 24 pp. (1919).—A preliminary paper giving some suggestions for operating with coal in water-gas plants. The actual results obtained and the details of operation, including chem. data, will be published later.

J. L. WILBY.

**Calorific value of New Zealand gas.** ANON. *Gas J.* 145, 587(1919).—A minimum of 500 B. t. u. net is proposed.

J. L. W.

**Bearing of Prof. V. B. Lewes work on today's carbonizing developments.** C. B. TULLY. *Gas J.* 145, 515(1919).—In his book "Liquid and Gaseous Fuels," Prof. Lewes argues against steaming of retorts on the ground that, due to generation of CO<sub>2</sub>, it is detrimental to the illuminating and thermal efficiency of the gas and is economically bad, having nothing whatever to recommend it. He advises the use of water gas as a diluent, saying that it will produce the cheapest B. t. u. obtainable, at the lowest possible capital outlay and costing not more than 0.4 d. per 1000 cu. ft. for repairs and maintenance of plant.

J. L. WILBY.

**Dehydration of various tars.** W. A. TWINE. *Gas J.* 145, 462-4(1919); *Gas World* 70, 149-50(1919).—Two methods are described. In the first method, tar containing 25-40% H<sub>2</sub>O is preheated in an ordinary boiler shell fitted with steam coils where the H<sub>2</sub>O content is reduced to about 7.5%. It is then run intermittently in charges of 120 gals. every hr. for 6 hrs. into a tar dehydrator consisting of an inverted cone fitted with a helical channel and working under a vacuum of 25 in. of Hg. Distn. is continued with continuous firing until the pitch is reduced to the correct m. p. In the second method, water-gas emulsion containing 45-75% H<sub>2</sub>O is treated in stills of the Hird, Hammond and Chambers type. The emulsion is preheated to an inlet feed temp. of 95-98° by passing through the waste gas flue in a 3-in. pipe. Successful working depends upon (1) constant H<sub>2</sub>O content of the emulsion, (2) regular feed to the still, (3) constant temp. of the feed, (4) regular firing. The H<sub>2</sub>O content of the tar is reduced to below 0.5%. The plant can dehydrate about 15 tons of 50% emulsion per 24 hrs.

J. L. WILBY.

**Importance of by-products during the war.** C. G. ARWATER. *Gas Age* 43, 339-43 (1919).

J. L. W.



**All-new water gas plant results at Providence.** WALTER RUSSELL. *Gas Age* 43, 277-82, 364-6(1919).—Full description of the plant is given and operating methods are discussed. With 3 U. G. I. standard water-gas machines, guaranteed to produce 3.5 million cu. ft. of gas per 24 hrs. yields from 16600 to 22200 cu. ft. of gas per run of 4 mins. were obtained. An av. of 37.3 lbs. of fuel were required per 1000 cu. ft. of gas. Both anthracite coal and coke were used of an av. analysis, resp., of:  $H_2O$  2.94 and 10.12, volatile matter 6.86 and 4.19, fixed C 73.70 and 73.77, ash 16.50 and 11.92. The av. consumption of oil per 1000 cu. ft. of gas for the yr. was 3.39 gal., with a residue of 23%, paraffin 74.5%, B. t. u. per gal. 105, B. t. u. of gas 589.

J. L. WILEY.

**Why American coke oven practice leads the way.** RICHARD GUNDERSON. *Gas World* 70, No. 1806 (Coking & By-products Sec.), 12-4(1919).—Three factors have contributed toward making the American by-product coking industry vastly more efficient than that of any other country: (1) application of science and research work in the industry; (2) location of coking plants at the steel works; (3) unity of control. (Also in *Gas Age* 43, 407-11(1919).)

J. L. WILEY.

**By-product (coke) plant of the Brier Hill Steel Co.** F. T. MORGAN. *Gas Age* 43, 351-3(1919).—An illustrated descriptive article.

E. J. C.

Effects of illuminating gas and its constituents in causing abscission of flowers in *Nicotiana* and *Citrus* (GOODSPEED, *et al.*) 11D. Sulfuric acid plants (P.) 18. Dry gas cleaner (ANON.) 9. Fractional combustion (BANCROFT) 2.

LEÓN, JUAN M. YÁÑEZ: *Yacimientos Carboníferos de las Provincias de Pallasca, Huaylas y Yungay*. Lima, Peru: Cuerpo de Ingenieros de Minas del Peru. 85 pp. For review see *Eng. Mining J.* 107, 723(1919).

WARNER, A. R.: *Coal Tar*. London: Sir Isaac Pitman and Sons, Ltd. 2s. 6d. net. For review see *Chem. Trade J.* 64, 305(1919).

**Fuel composition.** RICHARD F. DALTON. *Can.* 189,256, Mar. 25, 1919. One ton of coal dust or screenings is mixed with approx. 10 gal. of water-gas tar.

**Natural gas substitutes.** C. S. PALMER. *Can.* 189,403, Apr. 1, 1919. Fuel is heated in a chamber having thin nichrome walls by a highly heated gaseous medium without the direct introduction to the chamber of substantial quantities of air blast and simultaneously supplying highly superheated steam to effect the water gas reactions in the charge so as to produce a strongly reducing highly heated gaseous medium in contact with a substantial portion of the inner surface of the chamber. App. is also specified.

**Treatment of gases obtained from coal and other carbonaceous fuel.** E. V. ESPENHAHN. *Can.* 189,364, Apr. 1, 1919. Gases are purified by treating them at a temp. about their dew point with a concd. soln. of  $Na_4Fe(CN)_6$ . The concd. alkali soln. at the beginning of the operation has the Fe in suspension as the sulfide. The  $Na_4Fe(CN)_6$  may be used repeatedly.

**Gas producer.** W. D. TURNER. *Can.* 189,668, Apr. 15, 1919. The generator chamber has a hollow ring of fire brick built in as part of the furnace wall above the fire bars and provided at its inner wall with gas inlets and in its outer wall with gas outlets. The generator also has downwardly movable hinge doors having spring-controlled, pivoted arms associated with the under sides thereof for closing them.

Combustible liquid for illuminating purposes. A. S. LARSEN. Dan. 23,469, Sept. 2, 1918. Denatured alc. 60, crude benzene 15, and turpentine 25 are mixed for use as an illuminating liquid.

Coking apparatus. F. J. SIVYER. Can. 189,418, Apr. 1, 1919. Structure.

## 22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Gasoline standardization in states. G. W. GRAY. *Oil & Gas J.* 17, No. 41, 64-5 (1919).—The specifications for gasoline and kerosene in various states are given. The extreme variation is cited as showing the need of standardization of specifications.

R. R. MATTHEWS.

Still's important parts of refinery. W. F. STATHAM. *Oil & Gas J.* 17, No. 41, 58(1919).—The different products obtained from the various stills are shown starting with the crude still, or "pipe still." The combination still is now used in place of the straight steam still, it can be fired if desired and does not depend on steam alone for fractionation. Re-run stills for fractionating kerosene distillate are also combination stills. Tar stills are necessary where lubricating oils and paraffin are produced.

R. R. MATTHEWS.

Loss of petroleum by evaporation. J. H. WIGGINS. *Oil & Gas J.* 17, No. 42, 51(1919).—Most of the evapn. occurs in flow tanks and lease storage. Approx. 3 to 4% is lost during the first six months. Oil is generally held 4 to 6 months before being refined, which makes the loss an enormous figure. The tank with water seal top, sprinkling the roofs and protecting by lagging have all been used but no data are available showing their relative value. The present plan is to have about 10 of the largest companies share in field expts. and allow the Bureau of Mines to publish the results.

R. R. MATTHEWS.

"Degree of mercuration" of crude petroleum oils and their products for the control of refinery processes. J. TAUSZ. *Petroleum* 13, 649-54(1918); *J. Soc. Chem. Ind.* 38, 4A(1919).—A soln. of  $\text{Hg}(\text{OAc})_2$  in MeOH is shaken with the oil sample. Liberated AcOH is titrated with KOH soln. The number of cc. of *N* KOH required to neutralize the AcOH liberated by 100 cc. of oil is called the "degree of mercuration." The undesirable constituents, such as unsatd. hydrocarbons, S compds., asphaltic and resinous compds. and phenols, react with the acetate, forming Hg compds. and AcOH.

W. F. FARAGHER.

The viscosity of lubricating oils. E. ORLSCHLÄGER. *Z. ver. deut. Ing.* 62, 422-7 (1918); *Science Abstracts* 21B, 320-1.—O. in this portion of his extended series of articles upon lubricating oils, deals with the relation between viscosity and temp. He points out that it is customary to carry out the viscosity test at various temps. according to the intended application of the oil, the usual test temp. for transformer oils being 20°, for bearing oils at 50°, and for cylinder oils 100°. No formula or chart, however, has existed up to the present which would enable one to calculate the viscosity at any other temp. than that at which the observation was actually made. As a result of an extended investigation of the results obtained with many oils, O. has constructed curve diagrams which overcome this difficulty. By aid of these, the viscosity of any oil can be ascertained for any temp. when one detn. of it has been made. The only exceptions to the law governing the rate of change in the viscosity, with temp. variations, are: rape-seed oil, linseed oil, and blubber oil.

E. J. C.

Investigations with wood conducted at the forestry experiment station. H. BEEKMAN. *Boschbouwk. Tijdschr. Tectona* 11, 1-82(1918); *Expt. Sta. Rec.* 39, 246.

—An account of investigations conducted with the woods of Netherlands East Indies. The work deals with the identification of the woods by external characteristics and anatomic structure, their mechanical and physical properties, chem. compn., durability, and preservation. The results of mechanical tests are appended in tabular form.

E. J. C.

Determination of gasoline in gas (DYKEMA, NEAL) 21. Lubrication of air compressors (CONRAD) 18.

Distilling petroleum oils. A. F. G. P. J. VON GROELING. U. S. 1,295,088, Feb. 18. Crude oil is distd. by heating a portion of the oil under pressure, reducing the pressure on the oil and introducing into a still containing a portion of the oil to be distd., so that the latter is vaporized upon reduction of pressure and distn. is thus effected.

Lubricating grease. F. B. MASON. U. S. 1,294,136, Feb. 11. Crude commercial fatty acids are quickly heated with a heavy mineral oil to a temp. above 100° and the free fatty acids present are neutralized by the addition of dry  $\text{Ca}(\text{OH})_2$ . After heating for about half an hr. the neutralization is completed and most of the  $\text{H}_2\text{O}$  formed is evapd. A lubricant of the desired consistency is then formed from the product by thinning it as desired with mineral oil and a small amt. of  $\text{H}_2\text{O}$  is added to form an emulsion between the oil and soap. A similar product is also obtained if the entire quantity of oil used is added at the first of the process.

Coking crude-oil residuum. T. E. MURRAY and E. B. RICKERTS. U. S. 1,293,866, Feb. 11. Residuum from crude oil is coked by the action of hot gases in contact with it as it flows in a thin film over the inner surface of the coking chamber.

Turpentine-still. G. BURTON. U. S. 1,293,027, Feb. 4.

Subdividing asphalt, pitch or similar material centrifugally. K. B. HOWELL. U. S. 1,294,909, Feb. 18. Pitch, asphalt or similar material in molten condition is divided into a number of sheets by the action of a centrifugal app. which projects the sheets in divergent directions at different speeds into a cooling medium such as air in which powdered talc may be suspended to render the product non-adhesive.

Recovering fiber and asphalt from roofing scrap. B. A. ALLISON. U. S. 1,293,293, Feb. 4. Roofing scrap containing asphalt and fibrous material is boiled in an alk. soln., e. g., a 5% alkali soln., and the disintegrated mass of fibrous and asphalt material is removed and rolled into sheets, which are adapted for use as a heat-insulating or roofing material. Additional asphalt may be added before rolling.

## 23. CELLULOSE AND PAPER.

A. D. LITTLE.

The paper industry in Japan. ANON. *Daily Consular and Trade Reports*, U. S. Dept. of Commerce 82, 164-77(1919).—A description is given of the present status of the paper industry in Japan. Statistics on production, prices, and grades are given.

R. B. ROE.

Detection of soda and sulfite wood pulps in paper. R. WASICKY. *Papier fabr.* 16, 212-3, 228-9; *J. Soc. Chem. Ind.* 38, 131A(1919).—The sample is boiled with a 0.2% soln. of Gentian Violet, allowed to remain 2 min., rinsed with 95% EtOH, and immersed for 2 min. in 95% EtOH containing 0.5% HCl. It is washed for 15 min. in 95% EtOH renewing the latter once, and finally in  $\text{H}_2\text{O}$ . Pure soda-pulp papers lose the color entirely, while sulfite papers are stained a deep violet. By the use of known standards, the method is accurate to about 5%.

R. B. ROE.

**Nature of the cellulose of cereal straw. II.** E. HEUSER AND A. HAUG. *Z. angew. Chem.* 31, 166-8, 172-6; *J. Soc. Chem. Ind.* 37, 650-1A.—The crude cellulose prep'd. by the chlorination method with NaOH (cf. *C. A.* 12, 2439), contained 0.35% ash, while that prep'd. with  $\text{Na}_2\text{SO}_3$  contained 1.1%. The yield of crude cellulose was 54.60% with a furfural value of 13.30%, equiv. to 22.34% xylan. The calcd. yield of true cellulose was 42.97%. The original straw had a furfural value of 15.4, equiv. to 25.62% xylan on the dry ash-free basis; thus 47.32% of the original xylan remained in the cellulose. The proportion of xylan remaining in the cellulose varies inversely as the yield of cellulose, and is a function of the concn. of NaOH used for extg. the chlorination products. The furfural value of com. straw cellulose varies with the yield and severity of chem. treatment; it may reach 18%. Most of the xylan may be removed from crude straw cellulose by repeated extns. with 6% NaOH, but it has not been possible to reduce the furfural value below 1.95% in this way. Commercial bleached straw cellulose shows a Cu value of 3.0, unbleached straw cellulose 0.94-0.99, and the bleached cellulose after extg. until the furfural value reaches the limiting 2.0%, shows a Cu value of 0.61-0.78. Further bleaching may increase the Cu value to 15.5 without affecting the furfural value. Hence straw cellulose does not correspond to a special type of natural oxycellulose, but is an ordinary cellulose similar to that of cotton or wood, strongly contaminated with a pentosan and so modified by bleaching under industrial conditions, that the pulp contains a substantial amt. of oxycellulose. Further examn. to account for the residual 2% of furfural, indicates that this residue consists of a trace of xylan, equiv. to less than 1% furfural, which is obstinately retained by the cellulose, while 1.0-1.5% of furfural may be attributed to the cellulose itself as in the case of cotton cellulose. Hydrolysis with  $\text{H}_2\text{SO}_4$  resulted in a practically complete reduction to dextrose, and the constitution of straw cellulose apparently corresponds to that of cotton cellulose.

R. B. ROG.

**Clays for use in paper making.** RALPH B. ROG. *J. Am. Ceram. Soc.* 2, 69-73 (1919).—The important points are color, grit and retention. Color is compared directly with the standard white sample. Grit is det'd. by wet sieving through 200-mesh sieve. The best clays show not over 0.20% residue and many show under 0.10%. Retention is the ratio of the amt. retained in the paper to the amt. added. There is no satisfactory lab. test. Domestic clays are being increasingly used. C. H. KERR.

**Mechanical woodpulp.** P. ROCHON. *Le papier* 21, Nos. 10, 11(1918); 22, No. 1 (1919).—The author describes in these 3 articles the general processes of the manuf. of mechanical wood pulp. He describes horizontal and vertical grinders, and the *Voith magazine grinder*, and discusses the conditions which ensure the best results. He takes up screening and refining, giving detailed descriptions of both flat and centrifugal screens and of their action. He describes also the principle and the action of the deckers, save-all, and wet-machine, including the wet-machine with several vats. After enumerating the uses and properties of white groundwood, he concludes with a description of the process of making "brown" pulp, which consists essentially in steaming the wood before grinding.

A. P.-C.

**Pulp from waste wood.** C. FLAUNET. *Le papier* 22, No. 1, 23(1919).—The following process, which is applicable to such waste as edgings and saw-dust, is due to Messrs. Brech and Tylorowski, and is being used by the Rosenblum Company. The wood is introduced into a vessel, and a "solution" of resin solvents in water is added. The amt. of solvent should be 1.5-2% of the wood, more or less, and about 1% of ammonia is also added. The solvent should be of such a nature as to emulsify with water. The wood is cooked for 4-5 hours at 110°. When all the resin has been extd. the vessel is opened at the bottom when under a pressure of about one atm., thereby ejecting the liquid and vapor but leaving the wood. By adding lime before extg. the resins,

a lime soap is formed, the recovery of the ammonia is greatly facilitated, and the treated wood is lighter in color. The wood is then steamed, which obviates the necessity of chipping. It is then made into pulp by the sulfite process. A. P.-C.

**Eucalyptus as a source of paper.** J. MICOL DE PORTEMONT. *Le papier* 22, No. 1, 17(1919).—Eucalyptus yields about 42% of cellulose fibers. The fibers are rather short (about 0.9 mm.) but extremely fine (about  $16\mu$  in diameter), and consequently they felt very well, and they are also very strong. The tree possesses the advantage of a remarkably rapid growth, a growth of 20 years yielding about 1000 steres per hectare, while it is but very rarely that 500 steres are obtained from other species of 75 years' growth. The author suggests establishing eucalyptus forests in the swampy regions of Southern France, thereby creating an important source of wealth for the country and at the same time changing an unhealthy swamp into a healthy and habitable region. A. P.-C.

**Paper soles.** *Le papier* 21, 11, Nov. 1919, p. 190.—About 30 sheets of paper are first soaked in turpentine, and then treated with a glue made up of turpentine, Spanish white, resin lac, linseed oil and litharge. The compn. is then submitted to high pressure. After scraping and polishing it will furnish soles as waterproof and as durable as the best of leathers. A. P.-C.

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#### Progress of paper textiles in the United States (Brock) 25.

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**Recovering solvents from colloided nitrocellulose.** W. F. NASH. U. S. 1,293,515, Feb. 4. The excess of alc. and ether present in colloided nitrocellulose is removed by first displacing the contained ether with alc. and then displacing the contained alc. by means of  $H_2O$ .

**Cellulose manufacture.** E. SCHAUFFELBERGER. Can. 187,949, Dec. 17, 1918. A combination of app. used in making cellulose is described.

**Pulp and paper from garbage.** J. F. PUTTAERT and H. F. J. PUTTAERT. U. S. 1,294,163, Feb. 11. Cardboard is formed from garbage by first removing hard substances from it, crushing the remainder and reducing its moisture content to below 50%, then expressing a further portion of  $H_2O$ , extg. grease, working up the pulp with alkalies or other reagents, beating it and forming it into sheets.

**Stencil-paper.** E. THOMAS. U. S. 1,293,983, Feb. 11. A mixt. formed of ceresin 100, Al oleate 12 and wool wax 4 parts is used for coating Yoshino paper to form stencil sheets. The Al oleate gives the sheets great flexibility. Adhesion of the sheets, one to another, may be avoided by the use of a thin auxiliary coating of stearic acid.

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## 24. EXPLOSIVES AND EXPLOSIONS.

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CHARLES E. MUNROE.

**Glyceryl methyl ether dinitrates ( $\alpha$ -methylin dinitrate).** DAVID TREVOR JONES. *J. Chem. Soc.* 115, 76-81(1919).—The nitration of Grün and Bockish's glyceryl  $\alpha$ -mono-methyl ether with mixed acids between  $13^\circ$  and  $20^\circ$  for 20-25 min. gave a product completely sol. in the nitrating acids, but largely pptd. on diln., a remainder being extd. with  $Et_2O$ , giving a total yield of 77% theory, as a clear, colorless liquid  $b_{18} 124^\circ$ , approx. the same as the ether from which it was derived and  $22^\circ$  lower than  $C_6H_5OH(NO_2)_2$ . It crystallizes with difficulty to white monoclinic prisms, m.  $24^\circ$ , for which no labile modification was found. They were quite insensitive to friction, but on heating at a rate of  $5^\circ$  rise per min. exploded at  $182^\circ$ ;  $C_6H_5(NO_2)_2$  exploded at  $192^\circ$ . The liquid at

100° was 7-8 times more volatile than  $C_6H_5(NO_2)_3$ ,  $d_{15}^{15}$  1.374,  $n_D^{21}$  1.4478. It is sol. in many org. solvents but insol. in  $CS_2$  and light petroleum. It gelatinizes nitrocotton rapidly and after warming yields a softer and more plastic gelatin than  $C_6H_5(NO_2)_3$  does. Its explosive power is about  $\frac{2}{3}$  that of  $C_6H_5(NO_2)_3$ , but it is much less sensitive to shock. 75% kieselguhr dynamites made with each gave with a 1-kg. fall hammer 10 explosions in 10 falls of 20 cm. with nitroglycerin and but 2 explosions in 10 falls of 100 cm. with the dinitrate. In Trauzl blocks with these dynamites for equal charges nitroglycerin gave a 30-cc. and the dinitrate 22.9 cc. cavity. In the ballistic pendulum nitroglycerin dynamite gave 124.43 kg. and the dinitrate 93.76. The mol. f.-p. depression const. of  $C_6H_5(NO_2)_3$  with the dinitrate was found to vary from 72.4 to 81, which differed little from those heretofore found for  $EtNO_2$  and  $C_6H_5Cl(NO_2)_2$ . CHAS. E. MUNROE.

**The propagation of flame through tubes of small diameter.** WILLIAM PAYMAN AND RICHARD VERNON WHEELER. *J. Chem. Soc.* 115, 36-45(1919); cf. *C. A.* 12, 2276.—It is common practice to test miners' safety lamps by introducing them into an inflammable mixt. of coal gas and air. The speed of propagation of flame in this mixt. can be considerably faster than in any mixt. of  $CH_4$  and air and since any inflammable mixt. into which a miner's lamp may in coal mining be accidentally introduced will be a mixt. of air with marsh gas, which but rarely contains even traces of other inflammable gas besides  $CH_4$ , the use of coal-gas-air mixts. for such testing is justifiable only on the grounds of providing an adequate "margin of safety." This becomes unjustifiable if the "margin of safety" is excessive, for every additional protective device embodied in the construction of a miner's flame safety lamp militates against the proper ventilation of the lamp, and diminishes its light-giving power. It was therefore deemed important to make exact comparison of the speeds of propagation of flame in the two different mixts. under similar conditions of expt. and to obtain information on the effect of varying the proportions of the constituents in coal-gas on the speed of propagation of flame in their mixts. with air. The general conclusion to be drawn from these expts. is that "coal-gas" is an unsuitable gas to employ in testing miners' safety lamps for the following reasons: (1) Comparatively small variations in the compn. of coal-gas affect the speed at which flame can travel in its mixts. with air. In particular, a reduction in the proportion of paraffins which it contains, such as is usually accompanied by an increase in the proportion of H when, as generally, carbureted water-gas is employed to dil. the coal-gas, enables a much higher speed of flame to be attained than can be given by mixts. of  $CH_4$  and air. (2) Even with gas produced solely by the carbonization of coal at normal retort temps., the speed of propagation of flame attainable is more than double that possible in mixts. of  $CH_4$  and air. (3) It would seem that the ability of flame to pass through tubes or holes of small diam. is not dependent alone on its speed, although this is the main factor, but is to a certain extent a quality of the inflammable gas concerned. Flame in mixts. of H and air possesses the property of being able to pass through holes of very small diam., and the presence of H in coal-gas confers this property in a certain degree on the flame in mixts. of the latter with air. In tests of various coal-gas—air mixts. and  $CH_4$ —H—air mixts. it was found that the distance the flame was propagated diminished with the diminution of the diam. of the tube until when a diam. of 2 mm. was reached the propagation was *nil*. Mallard and Le Chatelier recorded for a H (30%) air mixt. a propagation in a glass tube of but 0.9 mm. diam. CHARLES E. MUNROE.

**The dilution limits of inflammability of gaseous mixtures.** III. The lower limits of some mixed inflammable gases with air. IV. The upper limits of some gases, single and mixed in air. HUBERT FRANK COWARD, CHARLES WILLIAM CARPENTER AND WILLIAM PAYMAN. *J. Chem. Soc.* 115, 27-36(1919); cf. *C. A.* 8, 2806, 3364.—The conclusions from the exptl. observations cited are for Part III. The lower limits of

inflammability, in air, of mixts. of H, CO, and  $\text{CH}_4$ , taken two at a time or all together, and also the lower limits of water gas, coal gas, and town's gas, may be calcd. with approximate accuracy from the lower limits of the individual gases by means of Le Chatelier's formula; and for Part IV: The upper limits of inflammability in air, satd. with water at 18-19°, of H,  $\text{CH}_4$ , and CO are in the neighborhood of 74.2, 15.4 and 74.2%, resp. The upper limits in air of mixts. of these gases, taken 2 or 3 at a time, and also the upper limit of coal gas, may be calcd. with approximate accuracy by means of a simple formula of an additive character. The photographs of the flames produced in long tubes are unique, that of H being a faintly luminous segment of a hollow sphere; that of  $\text{CH}_4$  a segment like that for H, colored blue, with reddish brown conical tail, that of CO shaped like a Welsbach mantle colored blue with a bright whitish blue edging; and that for a  $\text{CH}_4 + \text{CO}$  mixt. being a composite of the two latter figures.

CHARLES E. MUNROE.

**Application of nitro-aromatic compounds in explosives industry.** J. R. MARDICK. *Chem. Met. Eng.* 21, 311(1919).—The use is advocated of TNT and  $\text{C}_6\text{H}_5(\text{NO}_2)_3\text{OH}$  in the manuf. of commercial blasting explosives. They may now be produced at 10 and 12 c. per lb., resp., from  $\text{C}_7\text{H}_8$  at 18 c. per gal. and  $\text{C}_6\text{H}_5\text{OH}$  at 6 c. per lb.

CHARLES E. MUNROE.

**The ignition of explosive gases by electric sparks.** JOHN DAVID MORGAN. *J. Chem. Soc.* 115, 94-104(1919).—After reviewing Home Office Rept., Jan., 1915, on "Battery bell signalling systems" by R. V. Wheeler (cf. *C. A.* 9, 2190) and H. O. Rept., June, 1916, on "Electric signalling with bare wires," by R. V. Wheeler and W. M. Thornton, in which the ignition of explosive gases by sparks produced in signal bell circuits were studied, M. investigated low-tension sparks using air-core, open iron-core and closed iron-core cells with six different numbers of layers each, making measurements on the circuits after interruption. It is concluded that over the wide range of different conditions examined the igniting sparks all liberated the same amt. of energy. Regarding single spark ignition of explosive gases, initially at atm. temp. and pressure, the main results established are: (1) With a low-tension spark, the least spark energy required to ignite a given gas mixt. diminishes with increase of the voltage impressed on the spark circuit prior to the production of the spark. (2) When the circuit voltage is const., the spark energy required for ignition of a given gas mixt. by a low-tension spark is const. (3) With a high-tension spark (which consists of a capacity component preceding an inductance component), the incendivity of the spark (or ability to cause ignition) can be increased by increasing the proportion of energy in the initial part of the spark without increasing the total energy of the spark. (4) The incendivity of a condenser or capacity spark is greater than that of an inductance spark dissipating the same amt. of energy. (5) With a capacity spark, the least energy required for ignition of a given gas mixt. diminishes as the spark voltage increases. It is generally supposed that the energy required to produce ignition of a given inflammable gas mixt. is const. with similar physical conditions. If correct, then the fact that the total energy of the least igniting spark is found experimentally to vary with the conditions under which the spark is produced suggests that not all of the spark energy is utilized in the process of ignition, but only a portion at the commencement of the spark. It is possible that the inflammability of a gas as detd. by the least energy required to produce ignition is not const. for identical physical conditions of the gas, but it would appear to be useless to attempt an investigation of this by spark measurement. It is important to note that a spark is a varying source of heat which very rapidly reaches its max. intensity and then less rapidly disappears. Expts. prove that increase of the initial intensity of the spark results in increased incendivity. This indicates that ignition is due only to the initial part of the spark, and that in every spark there is a certain amt.

of unused energy which makes no contribution to the process of ignition. The proportion of unused energy must diminish as the initial intensity increases, but at present any measurements of the effective portion of the spark appear to be impossible. It follows from this that any attempts to specify the inflammability of a gas in terms of the total energy of the least igniting spark must necessarily yield the diverse results which have hitherto been obtained.

CHARLES E. MUNROE.

**Ammoniacal silver oxide solutions.** ALFRED TINGLE. *J. Ind. Eng. Chem.* 11, 379(1919).—A warning suggested by experience as to the dangerous explosive nature of such solns. due to the unexpected ready formation of  $\text{Ag}_3\text{N}$  even in absence of air.

E. J. C.

Standard alkali for mixed-acid control (HEARSEY, JOYCE) 7. Industrial value of the material of the national powder mills (ANON.) 18.

**Explosive.** K. V. NIELSEN and J. P. LARSEN. U. S. 1,293,882, Feb. 11. An explosive is formed of  $\text{NH}_4\text{NO}_3$  78.125, S 8.75,  $\text{KNO}_3$  7.5, glycerol 2.5, sago flour 1.25,  $\text{MnO}_2$  1.25 and resin 0.635 parts. This mixt. is stated to be insensitive to shocks and is exploded by a fulminate cap.

**Explosive.** A. J. MARIN. U. S. 1,293,154, Feb. 4. A "safety" explosive detonating freely in the open air with a No. 6 detonator is formed by mixing  $\text{NH}_4\text{ClO}_4$  44-47,  $\text{NaNO}_3$  32-34, a nitrohydrocarbon such as dinitrobenzene or TNT 29-34, and  $\text{H}_2\text{O}$  2-5 parts and compressing the mixt. so as to give it a density of a 1.25-1.6 after drying. Cf. C. A. 12, 226.

**Black gunpowder.** J. BUXBAUM. U. S. 1,293,326, Feb. 4. Black gunpowder is mixed with sufficient spirits of camphor to form a plastic mass and the mass is then dried. This treatment is stated to improve the properties of the powder for use in guns.

**Preventing explosions of guncotton in centrifugal driers.** F. D. CRANE. U. S. 1,295,089, Feb. 18. Premature explosion of wet guncotton in centrifugal driers is prevented by suddenly reducing the pressure within the receptacle surrounding the centrifugal wringer when the moisture content of the guncotton has been somewhat reduced by centrifuging. This sudden reduction of pressure causes rapid vaporization of the liquid remaining in the guncotton and thus serves to cool it and loosen up the mass.

**Recovering solvent from smokeless powder.** F. I. DU PONT. U. S. 1,294,066, Feb. 11. Solvents such as alc. and ether are recovered from smokeless powder or similar materials by gradually vaporizing the solvent and cooling this portion sufficiently to effect its condensation and returning (to the material undergoing drying) the uncooled and uncondensed solvent vapor. This method of drying smokeless powder serves to avoid waste of heat and cooling power.

**Priming composition for detonators.** C. J. S. LUNDGAARD. Dan. 23,470, Sept. 2, 1918. A priming compn. is composed of a mixt. of  $\text{Ca}(\text{ClO}_3)_2$ ,  $\text{Sb}_2\text{S}_3$ , and powdered glass, with the addition of red P and a binder such as shellac, resin, or rubber soln.

## 25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

The post-war world-markets for American dyes. ALFRED T. MARKS. *Textile Colorist* 41, 68-70(1919).

E. J. C.

Practical observations on the determination of indigo. W. DEINISCH. *Färber-Ztg.* 29, 183-4, 194-7(1918); *J. Soc. Chem. Ind.* 37, 648-9A.—Titration with  $\text{KMnO}_4$ .



is the best technical method for detn. of indigotin. Since the results vary with the diln. at which the titration is made, the oxidation cannot be expressed by a single equation. The titration can, however, be standardized by employing a pure sample of indigotin. Const. values are obtained for any diln. exceeding 1 part to 18,000 of  $H_2O$ . H. recommends a standard diln. of 1 to 25,000 of  $H_2O$ . It has always been considered that 1 mol. of indigotin takes up 2 atoms of O, forming isatin, but H. shows that the reaction is complete with 90.0% of this proportion of O. It is therefore possible to get accurate results by using a  $KMnO_4$  soln., prepd. and standardized by the usual methods:  $(FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O, KH_2(C_2O_4)_2 \cdot 2H_2O$  or  $H_2C_2O_4 \cdot 2H_2O)$ . The procedure is as follows: 0.3–0.5 g. of the finely powdered sample is warmed at  $70-80^\circ$  with 10 cc. concd.  $H_2SO_4$ , using 50 g. of garnets. After heating for 0.5 hr., the soln. is made up to 500 cc. Into each of 2 beakers, 25 cc. of the soln. are measured, and each is further dild. with 300 cc. of  $H_2O$ . Titration with  $KMnO_4$  (1 cc. = 0.539 g.  $Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$  = 1 g. indigotin) is carried out with each until only a faintly green color is perceptible. Then to one (A) is added 0.1 cc. of  $KMnO_4$ , so that when compared with the other (B), against a white ground, it has the paler green color. To (B) is then added 0.2 cc.  $KMnO_4$  soln., so that it shows the paler color. Then after bringing (A) to the same color (2 drops  $KMnO_4$  soln.), 1 drop more in either beaker will completely discharge the color of the indigotin. This method is the only satisfactory one for obtaining a definite end point in the presence of the reddish color of most samples of natural indigo.

W. F. FARAGHER.

**Determination of sulfur which produces sulfuric acid in sulfur dyeings.** W. ZANKER AND K. SCHNABEL. *Färber-Ztg.* 29, 26–9 (1918); *J. Soc. Chem. Ind.* 37, 685A. —S dyes when moist become acid in the air,  $H_2SO_4$  being formed. Presence of alkalies and increased temps. favor the oxidation. Various dyes were tested as purchased and after purification by dissolving 1 g. of dye and 2 g.  $Na_2S$  in 250 cc. of water, boiling for a short time, pouring into 3 l. of  $H_2O$ , acidified with AcOH, allowing to settle, washing 6 times by decantation with  $H_2O$  acidulated with AcOH, collecting the dye on hardened filter paper and drying at  $100^\circ$ . To est. the acid, the dye was mixed with 50 cc. 0.1 N NaOH, evapd. to dryness, and heated for 1 hr. at  $110-125^\circ$ . The labile S was thus converted into  $H_2SO_4$ , the wt. of which was ascertained by titrating back with standard acid, using phenolphthalein or litmus upon writing paper as the indicator. Results are tabulated for various dyes.

W. F. FARAGHER.

**Explanation of the printing of colored reserves on some vat dyestuffs.** R. HALLER. *Färber-Ztg.* 29, 1–3 (1918); *J. Soc. Chem. Ind.* 37, 688A. —In Haller's process for printing colored reserves (*C. A.* 12, 2445), Pomeranz considers that the indanthrene vat does not penetrate the printed vat dye, because the NaOH necessary to fix the indanthrene dye from the vat is not available, having reacted with the Zn and Mn reserve salts, thereby forming hydroxides of the metals (*C. A.* 12, 2446). H. maintains that the hydroxides of Zn and Mn are in the colloidal condition in the printed thickener and form a membrane which prevents the penetration of the indanthrene, which also is in the colloidal form. The NaOH, however, can penetrate the membrane and enable the reducing agent to reduce and fix the printed dye. The results of a process used at the Felmayer works, in which blue and red reserve effects are obtained by printing with  $MnCl_2$ ,  $Na_2Cr_2O_7$ , gelatin, etc., are held by H. to support his view.  $MnO_2$  produced on the fiber, in presence and absence of glue, shows entirely different forms, especially when the fiber is treated with cuproammonium soln. In the former case, a continuous membrane with uniform particles of  $MnO_2$  is formed, while in the latter case the fiber swells and then dissolves, leaving the  $MnO_2$  in comparatively coarse form. All thickening agents must act as "filters," thereby preventing the colloidal vat dye from reaching the fiber.

W. F. FARAGHER.

**Printed reserves with vat dyestuffs.** H. POMERANZ. *Färber-Ztg.* 29, 51-4; *J. Soc. Chem. Ind.* 37, 688A.—The stripping of indigo from a fabric by reduction and soln. in NaOH is unsuccessful because of the oxidation of the indigo white. This difficulty is obviated by converting the indigo white into an alkali-sol. compd. which is stable in air. ZnO and a quaternary ammonium base (Leukotrop W., B. A. S. F.) effect this change, making the process commercial. This same reaction makes possible the printing of bright indanthrene effects upon an indigo ground. Oxidation reserves either convert indigo white into insol. lakes, which are not fixed by the fiber, or prevent the vatted dye from fixation without intermediate oxidation. Cu salts, both sol. and insol., are good oxidizing reserves. With paranitraniline red, Cu salts are not permissible, but sparingly sol. salts of *m*-nitrobenzenesulfonic acid are suitable. These salts cannot be used with alk. prints, as sol. alkali salts are formed. Chlorides of Al, NH<sub>4</sub>, and Mn with a variety of filling agents, such as clay, PbSO<sub>4</sub>, etc., are used for indanthrene vats. The use of a reducing agent and the above salts with a vat dye gives a vat reserve for colored effects on vat grounds. In discussing Haller's views (cf. preceding abstr.), P. points out the possibility that the unreduced easily vatted dye may act as an oxidizing agent on the more difficultly vatted dye, thereby acting itself as a reserve.

W. F. FARAGHER.

**An investigation on the relative affinity for cotton and mordanting value of the tannins of galls, sumac, myrobalans, divi-divi, and quebracho.** ROY H. WISDOM. *J. Am. Leather Chem. Assoc.* 14, 6-9(1919).—W. analyzed samples of gall, sumac, myrobalan, and quebracho exts. and divi-divi in the raw material by the A. L. C. A. Official method. Solns. were prepd. containing 0.4 g. tannin per 100 cc. and pure cotton cloth was treated with these solns. to det. their affinity for cotton. The results are given in percentages of matter absorbed by cotton. Solns. were then made containing 0.5 g. of total solids per 100 cc. from each of the above materials and cotton cloth was treated with these as before. The % of matter absorbed by cotton based on the total solids was galls 21.3%, sumac 17.2%, myrobalans 16.6%, divi-divi 16.0%, and quebracho 19.7%. The mordanting values were obtained by washing the cotton treated in the above expts. and then passing it through an iron bath, after which it was ashed and the iron detd. This gives what was called the combining value. The relative mordanting value was then obtained by multiplying the combining value by the absorption value. On the total-solid basis the mordanting value was as follows: galls 135, sumac 118, myrobalans 98, divi-divi 80, and quebracho 66. In general, pure exts. should give the following mordanting values expressed in percentages using galls as a basis: galls 100%, sumac 87.4%, myrobalans 72.6%, divi-divi 59.2%. Since quebracho is an iron-green tannin it is not really comparable with the others as a mordant.

J. S. ROGERS.

**Progress of paper textiles in United States.** H. G. BROCK. *Textile Colorist* 41, 81-2(1919).

E. J. C.

**Textile substitutes in Germany.** ANON. *Textile Colorist* 41, 82-3(1919).

E. J. C.

**Stains and discolorations on cotton piece goods.** O. H. FORSDALE. *Color Trade J.* 4, 77-8(1919).—Stains most likely to occur during the bleaching process are caused by lime, soda ash, Fe, Pb, Cu, oxy-cellulose, pseudo-mauveine, oil and bacterial action. These are discussed.

L. A. OLNEY.

**"Mulberry flax" in Italy.** A. SANSONE. *Boll. assoc. ind. laniera ital.* 32, 52-4 (1918); *Bull. Agr. Intelligence* 9, 1108-9.—About 50 yrs. ago a strong, resistant paper was made for a short time in Bergamo, using mulberry fiber. The author describes (in the original) his full scale expts., showing that the most practical methods for sepg.

the fiber in the mulberry branches (loppings) was as follows: Soak the branches in pools or ditches (not necessary if wood is green); crush the retted or green branches with a heavy roller on a cement, wood, or tiled floor; collect the bark thus sepd.; crush the wet bark mechanically to sep. the epidermis, which is easily powdered; screen to remove impurities; bleach with alkalis and acids, and then with a hypochlorite soln. These expts. were made with the idea of using mulberry fiber as a cheaper substitute for jute for making sacking. Mulberry fiber, de-gummed and bleached, can give products of much greater value than jute. Pasqualis made pure textiles of "mulberry flax." The author advises that it should be treated to obtain more even fibers, although they are shorter, then carded; the longest fibers should be mixed with cotton, spinning wool, or hat felt while the shortest should be used as a  $H_2O$ -absorbent. "Mulberry flax" alone or mixed with wool or cotton dyes perfectly. Two-shade effects can be obtained in the mixed tissues by means of the acid dyes used for wool. The short fiber can be used in paper making to strengthen paper made with inferior material. The yield of bleached fiber is from 10 to 20% of the dry bark, i. e., 2 to 5% of the wt. of branches treated. To obtain the best results the mulberry should be grown with a low trunk.

F. W. SMITHER.

**Manufacture of waterproofed canvas.** E. R. CLARK. *India Rubber J.* 56, 175-6 (1918).—Waterproofed canvas for military purposes must possess the following characteristics: maintenance of waterproof qualities in spite of service conditions, resistance to mildew, and suitability of color. Five methods are mentioned: (1) Al soap; (2) asphaltum, paraffin, pitch, etc.; (3) duplex fabric; (4) cuprammonium and processes based on dissolved cellulose; (5) drying oils. No. 2 seems to be the best method when asphaltum is used; resin is an undesirable addition to the mixt.; wool grease and rubber mixed in paraffin have value. The faults of the others are: (1) admits  $H_2O$  under severe conditions; (2) duplex cloth is subject to decompn., and the adhesive is often poor; (3) too expensive and fabric becomes harsh and gives off irritant dust; (4) generally inferior and fabric has a tendency to spontaneous combustion. Methods of inspection comprize: examn. for pin holes, general characteristics, etc.; permeability to  $H_2O$  by use of accelerated tests of actual conditions; resistance to mildew propagation; effects of extremes of climate; and chem. analysis for detection of deleterious ingredients.

FRANCIS MCGOVERN.

**Waterproofing fabrics.** E. JENTZSCH. *Färber-Ztg.* 29, 3(1918); *J. Soc. Chem. Ind.* 37, 688A.—To waterproof loosely woven fabrics so that water will not drop through but may penetrate slowly, J. finds that basic acetate or formate of Al is most suitable, prior to wax-proofing.

W. F. FARAGHER.

**Degumming of silk without soap.** E. RISTENPART. *Färber-Ztg.* 29, 181-2(1918); *J. Soc. Chem. Ind.* 37, 649-50A.—By the process of Buschhüter and Voigt (Ger. pat. 291,159), silk is degummed by satg. it with a soln. of an alkali salt of an acid (other than a fatty acid) which is weaker than the amino acids of the sericin, followed by steaming. The sericin is sepd. from the fibers and is removed by a soap bath or by the foam from a boiling soap bath. Silicates, borates, carbonates, stannates, sulfides or aluminates are suitable, as are the salts of the acids of acaroid resin. The addition of 0.5 g. "monopol" soap per liter is advantageous, and after steaming, especially in the case of yellow silks, the material is rinsed in cold  $H_2O$  and preferably washed in a hot soap bath to remove the products from the gum and the coloring matter. The soap bath may be used repeatedly and eventually used for dyeing baths. The degumming action depends on the proportion of salt, e. g.,  $Na_2CO_3$ , to silk, and also on the concn. of the salt. For any given concn. of carbonate, a certain minimum wt. of carbonate must be present to effect complete degumming and an excess has no useful purpose. With decreasing concns. of  $Na_2CO_3$ , the minimum quantity required also decreases.

Thus, for a 1.0% soln., the minimum wt. of  $\text{Na}_2\text{CO}_3$  lies between 1.64 and 2.35% of the wt. of the silk; while for a 0.5% soln. the minimum is 0.85–1.63%, and for a 0.2% soln., 0.54–1.0%. Centrifuges are used, and the quantity of soda depends upon the wt. of soln. left in the silk. If the wt. of soln. remaining is twice that of the silk, the concn. must be 1.0%; if 2.5 times, the concn. must be 0.5%; and if 3 times, the appropriate concn. is 0.2%. The variations are explained by the increased hydrolysis of  $\text{Na}_2\text{CO}_3$  with decreasing concn. Since only the required wt. is used, there is no danger of attacking the fibroin.

W. F. FARAGHER.

The formation of the thread in the spinning of artificial silk. H. OST. *Z. angew. Chem.* 31, I, 141–4 (1918); *J. Soc. Chem. Ind.* 37, 542A (1918).—A comprehensive discussion is given of the effects of form of jets, pressure upon the solns., rate of drawing the threads, and concn. and form of hardening baths, upon the size and character of the threads. Viscosity tests for satisfactory solns., methods of making  $\text{Cu.NH}_4$  cellulose solns., and compn. of some hardening baths are included.

W. F. FARAGHER.

#### Prussian blue (FUCHS) 26. Dyestuffs as medicinal agents (HEYL) 11H.

BAKER, ALFRED F.: *Glossary of Textile Terms in Four Languages*. Alfred F. Baker. University of Leeds, England. For review see *Textile World J.* 55, 53 (1919).

BARNETT, E. DE BARRY: *Coal Tar Dyes and Intermediates*. London: Baillière Tindall & Cox, 8 Henrietta St., Covent Garden. 213 pp. 10s. 6d. net. For review see *Can. Chem. J.* 3, 136 (1919).

TAILFER, L.: *Practical Treatise on the Bleaching of Linen and Cotton Yarn and Fabrics*. Translated from the French. 2nd Ed. Revized and enlarged. London: Scott, Greenwood & Son. 337 pp. 15s. For review see *Textile Mercury* 60, 178 (1919).

Indoxyl. E. A. BOURCART. U. S. 1,293,680, Feb. 11. The pat. relates to a method for transforming arylglycinates or their derivs. into indoxyl without the formation of undesirable by-products. A mixt. of KOH 70 and NaOH 30 with  $\text{NaNH}_2$  30 parts is introduced into an autoclave fitted with a stirrer, while the mixt. is in dehydrated and heated condition and the pressure in the autoclave is raised to about 6–10 atm. by use of  $\text{NH}_3$  or aniline vapors. When the temp. has fallen to  $180^\circ$ , 50 parts of K phenylglycinate is introduced as quickly as possible while the temp. is prevented from rising above  $190^\circ$ . The reaction is immediate and as soon as the evolution of  $\text{NH}_3$  has ceased the melt is dissolved in ice-water and indigo is pptd. by usual methods.

Apparatus for dyeing yarn. M. NAGLE. U. S. 1,293,514, Feb. 4.

Purifying cottonseed-hull fiber. F. W. STOCKTON. U. S. 1,295,078, Feb. 18. Fiber sepd. from cottonseed hulls is purified by boiling in a 4% aq. soln. of caustic alkali for about 5 hrs. to soften the hull particles, mashing and disintegrating the latter by passing the material between rolls, and then subjecting the mashed mixt. to a cleaning operation to sep. the fiber from the disintegrated hull material.

## 26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Iron protection by paint. J. N. FRIEND. *Iron and Steel Inst. Carnegie Schol. Mem.* 9, 77–123 (1918); *Sci. Abstracts* 22B, 10–11 (1919); cf. *C. A.* 7, 3590.—F. exposed plates of open-hearth, cold-rolled and annealed steel plates, 1 by 2 feet, 0.03 inch thick.

for 5 to 30 months. The plates were used as received from the mill, sand-blasted, and pickled in  $H_2SO_4$ . The paints consisted of pigments in raw and boiled linseed oils. Expts. on the oils showed that the oil films without pigment increased a max. of 18% in wt. and 3.3% in vol. in about 27 days, and then began decreasing in wt. and vol. The vol. and viscosity changes cause the coat to crinkle at first, and then to crack. Polymerization of the oil took place at  $200^\circ$  and above. The permeability of the films was detd. by impregnating filter paper and allowing it to dry, and then tying it over the mouth of a bottle containing  $CaCl_2$  and noting the gain in wt. of the bottle when placed in a damp atm. Permeability decreases as polymerization increases. Pigments diminish permeability and expansion of the oil film and make it stronger and more viscous. The amt. of pigment should be as high as compatible with good body and working properties of the paint. Within limits, the protection afforded by the paint film, increases with the thickness, but two thin coats are better than one thick coat of equal wt. (cf. *C. A.* 6, 1071). From expts. with paints on colored glasses and with colored pigments on wood and steel, F. concluded that red paints protect better than white, green or black paints. Iron structures should be painted with mill scale intact after scraping off loosely adhering flakes and rust; sand blasted and pickled iron that has been subsequently painted does not resist corrosion as well. Careful removal of rust before painting does not seem necessary, but the evidence is not conclusive. Accelerated lab. tests are misleading.

F. A. WERTZ.

**Prussian blue.** HERMAN C. FUCHS. *Color Trade J.* 4, 92-3(1919).—The manuf. of Prussian blue is only profitable when carried out on a large scale. It is formed by direct pptn. of  $K_4Fe(CN)_6$  with a ferric salt, but in practice it is obtained by pptn. with a ferrous salt followed by oxidation with any suitable oxidizing agent. The following are chiefly used: (1)  $H_2SO_4$  and  $HNO_3$ ; (2) bleaching powder and  $HCl$ ; (3)  $K_2Cr_2O_7$  and  $H_2SO_4$ ; (4)  $KClO_3$  and  $HCl$ . Methods of procedure with each of the oxidation processes is described. Important considerations are the extremely fine state of division necessary for the different ppts. and long time required for settling of ppt. during washing process (ten days). Filtering and pressing of washed color is also a protracted and troublesome operation.

L. A. OLNEY.

**Ship bottom paints.** A. HUTIN. *Rev. chim. ind.* 27, 233-4(1918).—A brief review of the function and use of antifouling paints. H. gives analyses of 3 such paints and discusses the requirements of the French Marine Bureau. The following compds. are reported in the samples tested:  $Cu_2(AsO_4)_2$ ;  $(CuOAs_2O_4)_2 \cdot (AcO)_2Cu$ ,  $CuCNS$ , and  $HgCNS$ . The following formula has given good results: Pb arsenate, 1 kg.;  $CuHASO_4$ , 1 kg.; ocher, 8 kg.; white spirit (heavy), 5 kg.; rosin, 5 kg.; turpentine, 5 kg.; tar oil (with its light products), 3 kg.; bakelite A, 2 kg.

F. W. SMITHER.

**Hardness and viscosity of varnishes.** R. P. L. BRITTON. *Oil and Color Chem. Assoc.*, Sept. 17, 1918; *J. Soc. Chem. Ind.* 37, 594-5A(1918).—The practical varnish maker's "thumb nail test" for hardness of a film is inadequate, and the mechanical testers of Laurie and Baly, Jahns, and Clemens measure toughness rather than hardness. B. describes a method to det. true hardness by scratching the film with various crystals, similar to the method used for detg. mineralogical hardness. A method using gelatin points of varying  $H_2O$  content was also suggested. For viscosity detns., instruments which measure force as against time are recommended. B. has developed a viscosimeter which det. the time taken for a glass or metal ball suspended on one arm of a balance of high moment of inertia, to fall a definite distance through the liquid. The time required under similar conditions in air and in  $H_2O$  are used to standardize the instrument, and the viscosity is calcd. as the time taken in the liquid less time taken in air, divided by retardation for  $H_2O$ . As equilibrium is readjusted after im-

mersion of the ball, a correction is made for sp. gr. Some results are: linseed oil 7.7, olive oil 10.5, rape oil 12.1, castor oil 200. F. A. WERTZ.

**Pigments for printing inks.** T. M. TYSON. *Oil and Color Chem. Assoc.*, Nov. 1918, 1, No. 5; *J. Soc. Chem. Ind.* 37, 742A(1918).—Printing inks may be divided into two classes, "lithjo" and "letterpress." The pigments for the former must be completely free from acid, quite insol. in  $H_2O$ , possess good "solidity," moderate transparency, and not too high a sp. gr. Those for letter press inks must be brilliant and opaque and when used in process or three-color work, must have low sp. gr. The pigments are preferably composed of dyes fixed on alumina either alone or co-pptd. with blanc fixé, the lake and mineral pigments being pptd. simultaneously. Barytes or other abrasive material is quite useless as a base for either class of work. The desirable qualities of a good printing ink pigment are principally brightness and strength, the latter property ensuring that sufficient printed impression will be obtained by the use of a very thin film, thus guarding against liability to "set off" on the superposed sheet. Other properties are required for special purposes, *e. g.*, transparency and resistance to heat for tin printing pigments; insoly. in EtOH for labels which are subsequently spirit varnished; resistance to alkali for use on soap wrappers. A classification into degrees of fastness to light and the adaptation to different purposes of pigments of varying stability to light, alkali, etc., is given. F. A. WERTZ.

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#### African oil-yielding plants (PIERARETS) 27.

**Manufacture and use of japan.** W. P. DAVEY. U. S. 1,294,627, Feb. 18. Articles to be coated with japan are immersed in an emulsion which may be prepd. from asphalt, fish oil, or China wood oil, copal, Mn resinate and  $NH_4OH$ , an elec. current is passed through the bath, using the article to be coated as anode, and the coated article is then baked.

**Non-inflammable japan.** W. P. DAVEY. U. S. 1,294,422, Feb. 18. A japan adapted to be dried and hardened by heating and not readily combustible is formed of an emulsion of asphalt, a saponifiable oil such as China wood oil, copal, Mn resinate,  $NH_4$ , and  $H_2O$ .

**Oxidation product of coumarin and indene.** K. SCHLATTER. U. S. 1,294,836, Feb. 18. A material suitable for use as a varnish is produced by the action of chromyl chloride upon compds. of the coumarin and indene groups in the presence of a volatile solvent, a gum and an oil, *e. g.*, a mixt. formed of Chinese wood oil or linseed oil, coumarin, dammar gum and  $CCl_4$ .

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## 27. FATS, FATTY OILS AND SOAPS.

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### A. SCHERUBEL.

**Oil of Pistacia lentiscus.** *The Cyprus Agr. J.* 13, 28-9(1918); *Bull. Agr. Intelligence* 9, 1106.—In Cyprus an edible oil (shinia oil) is extd. from the fruit of *Pistacia lentiscus*, a plant which grows wild throughout the island. Although the consumption of this oil has increased greatly of latter years its prepn. only constitutes a small industry of the poor classes, who manuf. it for domestic use, and but little for commerce. The yield is about 18%. Owing to the primitive methods of prepn. it rarely keeps more than 3 months without turning rancid. R. H.

**The oil content of coconuts on heavy clay soil.** J. B. HARRISON AND C. B. W. ANDERSON. *Rept. Dept. Sci. & Agr. Brit. Guiana* 1916, 43-4; *Exptl. Sta. Rec.* 39, 544.—Analyses of coconuts growing on heavy clay soil in the exptl. fields of the de-

partment of Science and Agriculture are reported. The data given show that the oil content of the nuts compares favorably with the oil content of coconuts grown in various other countries.

E. J. C.

Experiments on the biological saponification of various fats from the French colonies. F. HEDM. *Bull. de l'office colonial* 11, 227-34(1918); *Bull. Agr. Intelligence* 9, 1106-7.—A study has been made of the fats capable of being split up and treated with castor-oil enzyme without having to be subjected to the different operations required for aq. acid or alk. sapon. The only fats on which castor-oil enzyme had any notable action under the exptl. conditions adopted, were oil of cotton, tea, the pericarp of aouara, the kernel of aouara, *Puntumia elastica*, *Carapa microcarpa*, *Sorindeia olessa*, and *Chrysophyllum congoense*. As a rule the proportion of acids formed is fairly low, and, with the exception of *Carapa microcarpa*, is rarely above the 80 or 90%, which has sometimes been found in sapon. with castor oil. This may be due to the relatively high temp. at which the fermentation tests were carried out, 37° to 38°, the optimum temp. being about 30°. This higher temp. was indispensable to maintain the fat in the liquid condition essential to the normal progress of fermentation. The initial acidity of the oils of the pericarp of aouara and *Chrysophyllum congoense* indicates that they contain a saponifying enzyme.

F. W. SMITHER.

"Sélé," "cocorico," and *Ximenia americana*, African oil-yielding plants. J. PIERAERTS. *Annales du Musée Colonial de Marseille* 25, [4] 1-21(1917); *Bull. Agr. Intelligence* 9, 1060-1(1918).—Of the 3 seeds examd., the first 2 came from the Belgian Congo and the third from British Africa. Sélé. P. examined a specimen from Mowbasa (Bengala district) prepd. locally by: (1) roasting the seed, decortication and winnowing; (2) disintegration of the kernel by pounding; (3) sepn. of the oil by boiling H<sub>2</sub>O; (4) removal of the supernatant oil and clarification by standing and filtration. The oil consists essentially of a mixt. of glycerides of oleic, linoleic, stearic, palmitic, and lauric acids. It also contains a small amt. of an unidentified acid of a higher mol. wt. Sélé oil is an excellent edible oil with good keeping qualities and is suitable for soap-making. It is useless for the manuf. of stearin products. It may be considered as a semi-drying oil to be classed with cottonseed oil. Cocorico. This plant is a variety of *Citrullus vulgaris*. The oil examd. was prepd. in April 1914, by a method similar to that used for sélé, except that decortication precedes roasting. The oil has all the desirable qualities of sélé oil. Cocorico seed contains 37.5% of oil which, in ratio to the kernel, is 50.45% of the dry matter content. The cake is rich in N and would make an excellent fertilizer. The tegument of cocorico seeds contains an appreciable amt. of N and would make excellent composts. The low unit yield and the difficult and slow decortication of its seed make cocorico useless for com. (export) purposes. *Ximenia americana*. This bush belongs to the Oleaceae family. In S. Africa the plant is called "zuur pruijn" (acid plum). In all probability the plant will be largely used commercially and cultivated more carefully and intensively. Particular attention is drawn to the hexabromide test and the special properties of the solid acids. Based on the % of Br derivs. insol. in ether *Ximenia* should come immediately after linseed and candle-nut oil in the list of drying oils, with respect to the linoleic acid content.

F. W. SMITHER.

*Elaeis poissonnii*, a new species of oil palm, in the Cameroons. FAUCHÈRE. *Bull. de l'office colonial* 11, 80-3(1918); *Bull. Agr. Intelligence* 9, 1061-2.—The species is remarkable for its fruit which is enclosed in a sort of fleshy sheath formed by the development of 6 staminodes contained in the female flower which, in the other varieties of *Elaeis* hitherto described, are always atrophied. The fruit weighs from 10 to 20 g. Annet distinguishes 2 varieties, tenera and dura. A comparison of these 2 varieties with each other and with the var. Lisombe of *Elaeis nigrescens* gave: Tenera, oily pulp 76%

(sheath, 37; pericarp, 39); nuts 24% (shell, 13; kernel, 11); oil yield of the pulp, 70.25%; of the whole fruit, 53.5%. Dura (same sequence), 44% (18; 26); 56% (42.6; 9.8); 58.6%; 55.8%. Lisombe, 61.5%; 38.5% (21.5; 17); 63.15%; 38.35%. The wts. in g. of the fruit, the pulp, kernel, and oil in 10 fruits are given for each of the chief varieties of *Elaeis* in the Cameroons (the 3 above and the var. Dibope). F. W. S.

**A study of the viscosity of various colonial oils.** F. HENM. *Bull. l'office colonial* 11, 251-64 (1918); *Bull. Agr. Intelligence* 9, 1367-8 (1918).—The viscosity of oils and fats varies with different physical properties. If oils are divided into 3 groups, drying, semi-drying, and non-drying, the viscosity increases considerably with the d. in each group. This also applies to fats. The viscosity of an oil does not appear to depend on the solidifying point and, except in the case of very viscous oils, it increases with the m. p. of the fatty acids. In the case of fats it increases with the m. p. of the fat or fatty acids. Viscosity also varies with the chem. compn. of the oil or fat and decreases as the oleic acid content increases. Viscosity varies with the I no. and, for liquid oils, is higher in proportion as this value is lower. F. W. SMITHER.

**Prospects for China's oil industry.** D. B. HOU. *Science (China)* 4, 321-5, 448-59 (1918).—H. discusses the specific properties of 19 vegetable oils produced in China, and indicates the industrial use for which each oil is best suited. Particular attention is drawn to the possibilities of tung oil (Chinese wood oil), and soy bean oil.

WM. H. ADOLPH.

**Note on the acidity of castor oil of Indo-Chinese manufacture.** ROSÉ. *Bull. econ. Indochine* 20, 643-8 (1917); *Expt. Sta. Rec.* 39, 504-5.—As the castor oil which is used as a lubricant for aviation motors must be abs. limpid and possess an acidity in oleic acid not exceeding 15 g. per l., investigations were conducted for the purpose of ascertaining the conditions under which such an oil could be prepd. Detns. of free acid in different samples of the oil showed that the acidity increases on standing unless the oil is heated to 95° for about 10 mins. This would indicate that increasing acidity is due to the action of enzymes in the oil which are destroyed by heat. If the heating of the oil is followed by immediate filtration, an oil of the necessary standard of limpidity and acidity is easily obtained. E. H.

**Contribution to the chemical study of the fruit of *Camelia drupifera*.** BOUVSIOR. *Bull. econ. Indochine* 21, 232-4 (1918); *Expt. Sta. Rec.* 39, 501.—Analytical constns. are given of the oil, press cake, and whole seed of *Camelia drupifera*. The oil obtained by pressing in the cold was limpid after filtration, very transparent, and of a golden yellow color and a sweet and agreeable taste and odor. Its chem. constns. were as follows: acid number in percentage of oleic acid 1.36, sapon. number 194.48, I number 82.82, Reichert-Meissl number 0.22, and unsaponifiable insol. fatty acids 93.79. The oil contd. no alkaloid or cyanogen compds., but traces of the glucoside saponin. B. considers that the oil would be suitable for soap making and, if the saponin were removed, would make an excellent table oil. The press cake could be used to advantage as a fertilizer, particularly as the saponin contd. in it is toxic for the larvae of insects.

E. H.

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The potassium problem and the utilization of olive-oil residue in Italy (L'ABATE) 18. The viscosity of lubricating oils (OELSCHLÄGER) 22.

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ELLIS, CARLETON: *The Hydrogenation of Oils, Catalysts and Catalysis; and the Generation of Hydrogen and Oxygen.* 2nd Ed. Thoroughly revized and enlarged. New York: D. VAN NOSTRAND Co. 767 pp. \$7.50. Cf. C. A. 9, 389.



**Hydrogenating oils.** C. ELLIS. U. S. 1,294,068, Feb. 11. A current of H is passed through a shallow layer of fatty oil to be hydrogenated, containing finely divided catalytic material. The unabsorbed gas is collected and a portion of it is purified by passing it through NaOH or soda lime. The purified portion is then combined with the remaining unpurified portion and this mixt. is used for further hydrogenation in a cyclic manner.

**Preparing cottonseed for milling.** W. E. McCAW. U. S. 1,293,830, Feb. 11. Natural cottonseed is prepd. for milling by heating to about 75-80° for about 10-45 min. and then cooling to atm. temp.

**Apparatus for extracting grease and oils from garbage.** C. EDGERTON. U. S. 1,293,738, Feb. 11.

## 28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

**Practical laboratory apparatus—filtering rack for sugar solutions.** C. W. HINES. *Philippine Agr. Rev.* 10, 434-5(1917); *Expt. Sta. Rec.* 39, 505.—The filtering rack described by H. was devised to obviate the delay in obtaining a clear filtrate in the prepn. of sugar samples for polarimetric work. The app. consists of a double filtering rack, each compartment contg. a double row of holes. Beneath the back row of holes in both front and rear racks are placed small pans or troughs of galvanized Fe which receive the first filtrate which passes. After the clear liquid has begun to pass through, the funnels are moved to the front row of holes and placed above clean beakers to receive the filtrate for polarization. E. H.

**Juice clarification and decolorization with a new carbon.** S. S. PECK. *Intern. Sugar J.* 21, 72-4.—See Report of Committee on Sugar Manufacture and Utilization of By-products, Hawaiian Sugar Planters' Association, C. A. 13, 667.

F. W. ZERBAN.

**Feed regulation of sugar factory steam boilers.** JAS. HAMILL. *Intern. Sugar J.* 21, 60-2(1919).—At times of sudden demand on the boiler, if the level of the water falls, the usual feed regulator opens and chills the boiler with a sudden supply of water. Conversely, when the demand for steam decreases suddenly the feed is cut off and there is no way of storing the excess heat till the fires can be lowered. This is particularly important in sugar mills with their sudden and large fluctuations in steam demand. If a feed water regulator could be devised with a time lag it would be desirable; so that when a sudden demand for steam came it would not at once turn on the feed, and would not at once turn off the feed in case of a sudden decrease. W. L. BADGER.

**Hinged housing for cane mills.** E. A. JARECKIE. *Sugar* 20, 504(1918).—The cap of the mill is made hinged, and the end opposite the hinge is combined with the hydraulic jack so that the whole cap can rotate about the hinge. The idea is to avoid binding in the bearings of the top roll. No kingbolts are used. W. L. BADGER.

Steffens-house waste water and stream pollution (COULTER) 14.

## 29. LEATHER AND GLUE.

ALLEN ROGERS.

**Degree of tannage in different stages of process.** OSKAR RIETHOF. *J. Am. Leather Chem. Assoc.* 14, 20-2(1919).—The author gives results of expts. made on

samples cut along the backbone 24 in. from the root of the tail and representing 3 different tan yards. Analyses showed degree of tannage from the sixth layer 90.3; half of tannage completed in 27 days and half time 71 days, the figure for the degree of tannage was 71.3, or in other words, in half the time the leather was four-fifths tanned. The second yard-degree of tannage after 108 days was 84.8; stock half tanned in 24 days; in half-time the degree of tannage was 74.0; or in other words in half time stock was three-fourths tanned. Third yard-degree of tannage from fifth layer after 87 days, was 86.2; stock half tanned in 29 days; in half time the degree of tannage was 64.3, and the stock was three-fourths tanned. It would be impossible to give a fixed rule for the extent of the tannage in half time because this depends on many factors; but, as a rule for our standard sole and belting leather tannages, in half time the stock is between three-fourths and four-fifths tanned.

J. S. ROGERS.

The quinone tannage. II. W. MOELLER. *Collegium* 1918, 210-3, 241-7; *J. Soc. Leather Trades Chem.* 3, 28; cf. *C. A.* 13, 522.—Anthraquinone and its derivatives are similar to diketones in their properties and do not give the ordinary quinone reactions. This fact has been attributed to constitutional influences, since the conversion of an adjacent benzenoid nucleus into an ethenoid compd. stimulates the latest quinone properties in anthraquinone. Thus the quinone or non-quinone nature of the phlobaphenes can only be settled by detn. of their constitutional properties and not by their behavior in the ordinary quinone tests. The coloration of pelt by quinone is due to a chem. reaction between quinone and the decompn. products of collagen. Quinone and alloxan give similar colorations with pelt. Alloxan oxidizes  $\alpha$ -amino acids to aldehydes and it probably exercises a similar function with regard to hide decompn. products. It is unlikely that alloxan has any tanning properties. Only benzoquinone and toluquinone correspond to alloxan in their behavior towards  $\alpha$ -amino acids. Thus quinones are divided into 2 classes: (a) those which merely polymerize, forming colloidal complexes, and have a quite stable quinone character such as the phlobaphenes; and (b) those which oxidize  $\alpha$ -amino acids, forming colloidal complexes as a result. Quinones unstable in  $H_2O$  belong to the second class, such as the polyphenols of the vegetable tannin colloid peptiser which can change through all phases of the quinhydrone formation up to complex colloidal humins. Quinone does not give a red color to the interior of the fibrils of fresh pelt, but if putrefaction has started the red color develops immediately. In the formaldehyde tannage it was noticed that formaldehyde combines with the free amino acids to form methylene compds. and that pelt treated with an excess of formaldehyde does not give any coloration with quinone soln. These expts. show that the first step in quinone tannage is an oxidation process facilitated by the free amino acids present resulting in the formation of hydroquinone and then quinhydrone. The oxidation proceeds to the formation of colloidal humins. Unchanged quinone cannot be detected in finished quinone leather. How far the aldehydes formed from the  $\alpha$ -amino acids contribute to the quinone tannage is still undetermined.

R. W. FREY.

Elementary structure of the leather fiber. Principles of the molecular physics of leather. W. MOELLER. *Collegium* 1918, 157-73, 202-10, 230-40; *J. Soc. Leather Trades Chem.* 3, 28-9.—Hide tissue fibrils, although of ultramicroscopic size, are not homogeneous like ordinary cryst. structures. All organized matter consists of mixtures of chemically different substances, of which one is a solid cryst. compd. and the other surrounds these crystals like  $H_2O$ . Hide fibrils appear to be constituted with mixed crystals of collagen and its hydrolytic products. The collagen molecules form ultramicroscopic crystals called micells. From the complicated chem. structure of the protein mol. it must be inferred that the collagen micell is much larger than the micells of hydrolyzed collagen and that the collagen micell is permeable only to molecularly

dispersed compds. The collagen micell is probably polyhedric and elongated somewhat, and on swelling becomes spherical. The polyhedric form is retained to a certain degree and on drying the micells arrange themselves so that their ends will again be in contact. The optical axes of the micells will be disturbed in all directions but the micells are in chains and the general direction of these will not be altered. In gelatin the collagen micells have almost all disappeared and the hydrolytic products increased at their expense, thus producing a network. A broader conception of crystals now prevails and chem. homogeneity is no longer their essential property. Anisotropy in crystals is due to a kind of trellis-work structure and no real state of amorphy exists. Authorities are quoted to show that to a certain extent the properties of cryst. substances can be applied to amorphous substances. The adsorption phenomena shown by certain crystals lead to the conception that the structural elements of a hide fiber behave like a cryst. system with the inference that there is a trellis-work structure among the micells. Those substances which swell or dehydrate the micells or the micellar network cause pressure on the micellar structure with the result that the axial orientation is diverted from the longitudinal direction. All tannins have this property and the twisting of the micellar chains can be followed microscopically. There seems ground for assuming that the micells are not arranged in the same longitudinal plane but spirally. The wave-like appearances observed in gelatin jellies are a direct proof of the presence of a micellar framework in the fibrils, and that these are arranged in the form of layers of network. The anisotropy of the fibrils depends upon the fact that the micellar chains arrange themselves in lines parallel to their optical axes. The astringency of the tannin causes the micells to impinge on each other, hence anisotropy disappears. Tanning of micellar chains is only possible if they are under no stretch. In such a condition, in consequence of the action of the peptizer in the tanning soln. an alteration takes place in the arrangement of the micellar chains whereby the micellar interstices are enlarged and the peptized substance is brought into direct contact with the micellar chains. If hide is under tension, then the micellar chains are under tension and they are not penetrated by the tannin although the whole hide may appear tanned through.

R. W. FREY.

**The action of neutral chlorides on chromic chloride solutions.** MABEL E. BALDWIN. *J. Am. Leather Chem. Assoc.* 14, 10-9 (1919).—Solns. of  $\text{CrCl}_3$  containing increasing amts. of neutral chlorides were prepd. so as to give 13.77 g. per l. of  $\text{Cr}_2\text{O}_3$  and concns. of the neutral chlorides equal to 0, 1, 2, 3 and 4 *M* solns. The salts used were  $\text{KCl}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{NaCl}$ ,  $\text{LiCl}$  and  $\text{BaCl}_2$ . Electrometric measurements of the H-ion concn. were made immediately after prepn. and also 50 days later. These measurements show that the H-ion concn. is increased by the addition of neutral chlorides although the total amt. of acid H remains the same. The neutral salts differ in their ability to increase the H-ion concn. The order of this increase is as follows:  $\text{KCl} = \text{NH}_4\text{Cl}$ ,  $\text{NaCl}$ ,  $\text{LiCl}$ ,  $\text{BaCl}_2$ . A similar series of expts. was conducted, using a 0.1 *M* and a 0.004 *M*  $\text{HCl}$  soln. instead of the  $\text{CrCl}_3$  to det. if hydrolysis of the Cr salt was a factor in influencing the result. When the neutral chlorides are arranged in the order of their increasing degree of hydration at infinite diln. the following series is obtained:  $\text{KCl}$ ,  $\text{NH}_4\text{Cl}$ ,  $\text{NaCl}$ ,  $\text{LiCl}$ ,  $\text{BaCl}_2$ . The salt which unites with the greatest no. of mols. of water is the salt which is most effective in increasing the H-ion concn. and therefore in increasing the amt. of alkali necessary to start pptn. in a chrome liquor. Comparison of the results obtained in this acid series with those obtained in the  $\text{CrCl}_3$  series show that the neutral salt effect is not a result of the hydrolysis of the Cr salt, the H-ion concn. being effected in a similar manner by the neutral chloride in the acid series as in the  $\text{CrCl}_3$  series. In aq. soln. the mol. and ions of a salt combine with mols. of water. Since these hydrated particles, each one of which contains a comparatively large no. of mols. of water, func-

tion as a unit constituting the solute, a portion of water is removed from the solvent, and the amt. of water acting as solvent is thereby diminished. This has the effect of increasing the H-ion concn. Actual acidity as differentiated from total acid H, appears therefore to be due not to the concn. of H ions in mols. per l. of soln., but to a ratio between the no. of H ions and the no. of water mols. That the hydrate theory affords an explanation of the neutral salt effect is thus made much more vivid by electrometric measurements of H-ion concns. J. S. ROGERS.

**Note on Kjeldahl's method for the determination of nitrogen as applied to gelatin.** H. G. BENNETT AND N. L. HOLMES. *J. Soc. Leather Trades Chem.* 3, 24-7(1919).—Difficulty in obtaining concordant results for N in gelatin led to expts. for detg. the shortest reliable time and the best method for complete hydrolysis. Sheepskin gelatin, of especially good quality was digested with  $H_2SO_4$  for varying periods under the following conditions of acceleration: (1) with no accelerator; (2) with 2 g.  $Na_4P_2O_7$ ; (3) with 5 g.  $Na_4P_2O_7$ ; and (4) with 10 g.  $K_2SO_4$ . The data show that the clearing of the soln. during digestion is no sign of complete hydrolysis and that in all cases prolonged digestion gives low results through loss of  $NH_3$ . With  $H_2SO_4$  alone correct results cannot be obtained as very long digestion is necessary for complete hydrolysis and, although the % N increases up to about 12 hrs. digestion it afterwards decreases slowly, due to loss of  $NH_3$ . It is also shown that  $Na_4P_2O_7$  is not quite as efficient as  $K_2SO_4$ , and that 10 g. of the latter and 4 to 6 hrs. digestion give the most reliable results. The results for all expts. are presented in tabular and graphical form. R. W. FREY.

**Determination of the adhesiveness of glue.** M. RUDELOFF. *Mitt. kgl. Materialprüfungsamt.* 36, 2-49(1918); *J. Soc. Chem. Ind.* 37, 743A.—The soln. of the glue is applied to the planed end surfaces of 2 pieces of red beech wood 185 mm. long, 125 mm. broad, and 50 mm. thick, and these are placed so that the glued surfaces cross at right angles. The glue film is then allowed to dry under definite pressure, and the force required to tear the pieces of wood apart is measured by means of a suitable machine. In a series of detns. made in this way it was found that for glue solns. up to 200% of water (referred to wt. of glue dried at 100°) the tenacity of the film decreased in proportion to the extent to which the wood was heated prior to glueing, but that in the case of solns. with 300% of water the greater degree of heating had a favorable influence. The tenacity of the glue film does not decrease in direct proportion to the rise in the amt. of water. In the case of solns. with 100 to 150% of water the pressure under which the glue film is dried has no appreciable influence on the tenacity of the film, but with higher amts. of water the drying pressure has considerable influence, especially when the wood has been previously heated. The most suitable conditions for testing samples of glue by this method are the use of solns. contg. 150% of water, previous heating of the pieces of wood to 40° in dry air, and drying of the film under a pressure of not less than 0.84 kg. per sq. cm. Solns. contg. 100 to 150% of water give concordant results by this method, which may also be used for comparison with the results obtained by detg. the viscosity at 35° of glue solns. with 556% of water. E. J. C.

### 30. RUBBER AND ALLIED SUBSTANCES.

JOHN B. TUTTLE.

**The rubber industry—past and present.** B. D. PORRITT. *J. Roy. Soc. Arts* 67, 252-67; *India Rubber J.* 57, 411-5, 445-8(1919).—Historical review of the early uses of crude rubber, the discovery of the vulcanization process, and the subsequent development of the industry; particularly valuable for its early patent and literature references.

JOHN B. TUTTLE.

The factors which influence the latex flow from *Hevea brasiliensis*. W. H. ARISZ. *Arch. Rubbercultuur* 2, 347-60(1918).—The depression of f. p. (indicating the amt. of salts, quebrachite, sugars) produced by latex derived from a given tree under various conditions is studied. At 0.3 m. from the ground the latex obtained from a root cut gives a smaller depression than latex obtained from an ordinary cut. (Extreme figures were 0.642 and 0.830%.) When the latex from a given cut is collected in two parts, the part issuing last gives a smaller depression than that issuing first. The latex obtained at 3.5 m. gives a greater depression than that obtained at 0.3 m. When collected in two parts, the second part again shows a smaller depression than the first. It is concluded that the latex obtained from a cut during the later period of the flow probably has its origin in the lower parts of the tree—in the case of the ordinary cut, in the roots. In agreement with this view is the following observation: When a cut is divided into three sections, and the latex from each section is collected, in two parts, separately, the diminution in the depression produced by the second part as compared with the first is greater in the middle section than in the end sections. It is assumed that the second part from the middle section comes almost entirely from the roots, while that from the end sections comes partly from the layer just outside the ends.

G. S. WHITBY.

The preparation and vulcanization of plantation Para rubber. B. J. EATON, J. GRANTHAM AND F. W. F. DAY. Kuala Lumpur. *Agr. Bull. Federated Malay States* 17, 1-398(1918); cf. C. A. 10, 112, 400, 1113-5, 2539-40, 3000; 11, 222-3, 899, 1055, 2417, 2550; 12, 107, 439, 637, 1010, 1135-6, 2711.—In this bulletin the authors have united their previous publications on the subject of the variability of plantation Para rubber, adding further exptl. data in many instances. The conclusions from all this work may be summarized as follows: First-grade plantation Para rubber, either pale crepe or smoked sheet, is more variable than hard fine Para. This variability manifests itself in the rate of vulcanization and the tensile properties, and is caused by varying amts. of org. accelerating agents from two sources, (a) a decompn. product of the protein of the latex, (b) substances which exist in the latex, and are not removed under certain conditions of prepn. The first named is probably an amine or amino acid. By light pressing of the coagulum, and allowing it to mature for 6-7 days, the max. amts. of accelerators are formed, and are not removed later in creping. Smoking the rubber, formalin, boric acid, tannic acid, and certain antiseptics inhibit the formation of the accelerators and hence retard vulcanization. Sterilization by heat or refrigeration act in the same manner, although in these cases the reaction may take place after the influence of these factors is removed. Under certain conditions, the N content showed some relationship to the rate of cure, the lower the N the more rapid the rate of cure, but this did not apply universally, and hence cannot be used to det. the rate of cure. AcOH has been found to be the most satisfactory coagulating agent, but other org. acids can be used. Mineral acids are not satisfactory as they injure the rubber. Alum is objectionable, but NaHSO<sub>3</sub> is permissible for pale crepe. The poorer grades of plantation rubber are usually more uniform than the better grades, largely because they are more thoroughly mixed. In technical mixings, the use of PbO or org. accelerators, tends to obscure or entirely to overcome the variability in the rate of vulcanization of the raw rubber. The bulletin contains a bibliography on the subjects of variability and testing of rubber, and a detailed description of the rubber factory at Kuala Lumpur where these researches were made.

JOHN B. TUTTLE.

Differences in weight in the preparation of sheet and crepe rubber. O. DE VRIES AND H. J. HELLENDORF. *Arch. Rubbercultuur* 2, 361-400(1918); *Meded. Cent. Rubberstation* 8, 1-40.—An extended series of expts. ascertaining the differences in the wt. of the product from a fixed quantity of latex, which are brought about by a

considerable range of differences in the procedure. It is found that leaving the coagulum standing in the serum, soaking the coagulum in water, diluting the latex, all lead to a smaller wt. in the product. Sheet is always markedly heavier than crepe prepd. under the same conditions of diln., etc., The following are relative figures for a few of the conditions examd.; they include the conditions usual in practice. Crepe from latex is dild. to 15%, the coagulum being kept in the serum, and rolled the following day, 100; crepe from undild. latex, the coagulum being rolled a few hrs. after coagulation, 100.9; sheet from undild. latex, the coagulum being kept in the serum and rolled the next day, 101.4; sheet from latex dild. to 15%, the coagulum being kept in the serum and rolled the next day, 100.6. The moisture content of most of the samples was detd. It was higher, the greater the relative weight of the rubber, i. e., the larger the amount of serum solids included.

G. S. WHITBY.

**Vulcanization tests.** VI. L. E. CAMPBELL. Dept. Agr. Ceylon, *Bull.* 35; cf. C. A. 12, 543.—Vulcanization expts. were carried out with rubber from latex of trees 16–20 years old. The samples were prepd. by adding creosote or formalin to the latex before coagulation with AcOH. The rubber was formed into sheets or blocks, part being dried at once and the remainder left wet. Moist rubber was found to vulcanize more rapidly than the dried samples from the same latex and appeared to have as good physical properties. It also contained more resins and less protein. Considerable differences in time of cure occur in plantation rubber prepared at different times of the year from the same trees by identical methods.

OSMAN J. WALKER.

**Some remarks on the aging of vulcanized rubber.** O. DE VRIES. *India Rubber J.* 57, 77–81 (1919).—On account of comment on a previous article, further expts. using accelerated aging tests, i. e., heating a vulcanized mixt. of 92.5 parts rubber and 7.5 parts S at temps. of 65–72°, after 70, 90 and 110 min. cures, for 24 hrs., enable the author to draw the following conclusions: (1) Stress-strain curve shifts its position in the same way as in ordinary vulcanization. The change during the first 24 hrs. is greater the shorter the time between curing and aging; change on further heating is practically the same for all states of cure with coeff. of vulcanization of 2.4%. Change on prolonged heating decreases, without coming to a stop before brittleness is reached as in overcure. (2) Tensile strength, though increasing as in prolonged vulcanization for a given stress-strain curve, does not reach the value obtained by ordinary vulcanization for samples with a coeff. of 2, 3 and 4%; the tensile strength on aging first shows an increase, but later the rubber becomes brittle. (3) Coeff. of vulcanization at temps. below 80° shows a small increase, so that the above mentioned physical changes which in ordinary vulcanization accompany the increase in combined sulfur, in aging are not a part of this chem. reaction. This last conclusion challenges the theory of Stevens (cf. C. A. 12, 2710) that coeff. of vulcanization is a safer guide for judging aging properties of rubber than the stress-strain curve. Alteration in vulcanized rubber after the first 24 hrs. of rest is so slight that it can be disregarded and reliable tests can be made after this period.

FRANCES MCGOVERN.

**Influence of certain chemicals on the inner qualities of rubber.** O. DE VRIES. *Arch. Rubbercultuur* 2, 67–104 (1918); *Meded. Centraal Rubberstation* 6, 1–38.—The effect on quality of each of the three anti-coagulants and two anti-oxidants most commonly used on rubber plantations is examd.  $\text{Na}_2\text{SO}_3$  has a small but distinctly favorable effect, producing, when added to the latex in the customary proportion of 1 g. per l. of 15% latex, improvements of 0.0–0.03 kg./mm<sup>2</sup>. in the breaking stress, 5–10 mins. in the rate of cure, 1–1.5 in the slope of the stress-strain curve, and 0.02–0.04 in the viscosity index.  $\text{CH}_3\text{O}$  has a prejudicial effect on the quality. If used in the usual proportion, 0.25–1 cc. formalin per l. 15% latex, the effect is small only, the figures

remaining well within the limits of ordinary variation of plantation rubber. But in larger quantities (which cannot always be avoided in practice) its effect is serious, 2-4 cc. affecting adversely the breaking stress by 0.0-0.08, the rate of cure by 5-15 mins., the slope by 0.5-1.5, and the viscosity index by 0.03-0.09. Formalin affects the quality, not only by its relation, as a disinfectant, to the biological processes in the unrolled coagulum, but also by acting directly, as it were, on the rubber. Formalin exerts an unfavorable effect when it is introduced into the rubber after the coagulum has been rolled, as when the coagulum is soaked in formalin, exposed to  $\text{CH}_2\text{O}$  vapor, or has paraformaldehyde added to it along with S on the mills. The third anticoagulant,  $\text{Na}_2\text{CO}_3$ , is intermediate between the other two. It has a slight improving effect.  $\text{NaHSO}_3$ , like formalin, acts in two ways, but here the ways are opposed, the direct effect being advantageous, while the effect in retarding the biological processes is prejudicial. Under ordinary conditions of working, the quality of the rubber is improved. The usual proportion of  $\text{NaHSO}_3$  (0.5-1 g. per l. latex) improves the breaking stress by 0.0-0.05, the time of cure by 5-10 mins., the slope by 1-1.5, and the viscosity index by 0.03-0.15.  $\text{Na}_2\text{S}_2\text{O}_5$  produces a very small improvement in the rate of cure and the viscosity. The effect was examd. of  $\text{AcONa}$  and of  $\text{H}_2\text{SO}_4$ , substances which will be formed when  $\text{AcOH}$  is added to latex containing  $\text{Na}_2\text{SO}_3$ ,  $\text{NaHSO}_3$ ,  $\text{Na}_2\text{CO}_3$ , or  $\text{Na}_2\text{S}_2\text{O}_5$ . The former produces a distinct increase in the rate of cure and the viscosity, but has no effect on the slope. The latter has no effect on the rate of cure, but produces a marked improvement in the slope (approx. 2 units) and a slight increase in breaking stress and viscosity.

G. S. WHITBY.

**Solid rubber tires.** ANDREW H. KING. *Chem. Met. Eng.* 20, 352-9(1919).—A popular, not absolutely accurate description of the methods used in the manuf. of carriage and motor truck solid tires and cushion tires.

JOHN B. TUTTLE.

**Destructive distillation of automobile tire beads.** A. DUBOSC. *Caoutchouc et gutta-percha* 15, 9617-9(1918).—For comparison of products obtained by destructive distn. of crude rubber with those of a vulcanized rubber product, D. subjects tire beads, after removal of all but the last layer of fabric, to distn. in an iron retort, provided with a thermometer, and connected with an ice-cooled condenser from which the products are passed into a measured vol. of  $\text{H}_2\text{O}$ . Active decompn. takes place between 75 and 145° and is complete at 245°. Products are as follows: residue 52% consisting of C 10.92% and ash 41.08%, composed of  $\text{ZnO}$ ,  $\text{PbO}$ ,  $\text{CaCO}_3$ ,  $\text{MgO}$ , and insol. matter; oil, 28.99%;  $\text{H}_2\text{O}$ , 8.33%; and gases (by difference), 10.68%. The condensed liquid contains  $\text{AcOH}$ ,  $\text{C}_4\text{H}_8$ ,  $\text{PhMe}$ ,  $\text{PhEt}$ , and dipentene, but no isoprene or heveene as in the case of crude rubber; the gases were  $\text{H}_2\text{S}$  and  $\text{C}_2\text{H}_4$ .

FRANCES MCGOVERN.

**Nature of mottling of vulcanized para rubber.** H. RIMPEL. *Gummi-Ztg.* 31, 144; *Chem. Ztg.* 42, 119; *J. Soc. Chem. Ind.* 37, 595A(1918).—The sample examd. was free from substitute and yielded only about 3% ash. The lightest colored patches contained about twice as much free S as the darkest. R. explains their formations as follows: After vulcanization the S which has not combined chemically with the rubber passes on cooling into the amorphous or rhombohedral form, except at the surface, where octahedral crystals quickly sep. S wanders from the interior to the surface, causing bloom. At the same time there occurs the conversion of the less stable into the more stable form within the sample, the rubber acting as a solvent, and the S wanders from certain parts of the soln. and collects at other centers. ELMER A. DANIELS.

**Manufacture of waterproofed canvas (CLARK) 25. Testing of sodium bisulfite (VAN HEURN) 7. The mutual condensation of unsaturated compounds in connection with terpenes, resins and rubber (PRINS) 10.**

**Rubber-like substance.** H. S. A. HOLT and G. STENNING. U. S. 1,294,662, Feb. 18. A substance similar to rubber and insol. in  $C_6H_6$  is obtained by polymerizing isoprene or other hydrocarbon of the butadiene series in the presence of about 3% of an org. ozonide (such as 2,3-dimethyl-1,3-butadiene ozonide or oxidized caoutchouc), which is capable of intimately mixing with the hydrocarbon. The polymerization is effected by heating for some time at 60-100°.

**Rubber substitute.** H. H. HAZELTINE. Can. 189,232, Mar. 25, 1919. A rubber-like substance comprizing a mixt. of fixed oil, S and ZnO free from air and moisture which has been subjected to heat, pressure and agitation until the nascent period of the elements reacting has ceased.

**Adhesive rubber composition.** E. M. SLOCUM. U. S. 1,293,957, Feb. 11. An adhesive mixt. adapted for coating tape is formed by mixing thickened castor oil, dissolved in a solvent such as gasoline, with a rubber-containing latex, and coagulating the mixt.

**Coating for handles of trade and sporting implements.** W. S. SELLARS and W. W. TAYLOR. U. S. 1,293,949, Feb. 11. A soln. of equal amounts of gutta percha and balata is used for coating handles of tools, golf clubs, ball bats or other articles to produce a slightly yielding grip which does not become sticky or tacky from the heat of the hand.







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